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Just a thought! Bare in mind, this is just a rough draft.

If you believe that spacetime curvature is what causes gravity/light bending/time dilation and the several array of phenomena we observe in the universe, and that mass/energy causes spacetime curvature. SET reframes this, by saying, mass and energy does have an effect on the fabric of spacetime. But it isn't spacetime curvature, but rather, the gravitational effects we experience, are the effects of mass driven expansion. Tag along.

In SET mass emanates/expands space at the rate of

$Q = 4\pi \sqrt{(2\ G\ M\ R_0^3}$
For all other calculations we use:
$Q = 4\pi\sqrt{2GMR_0^3}$

Using mass–density–radius relation for a uniform sphere. $R^3 = 3M/(4\pi\rho)$
we get:

$Q = \sqrt{24\pi G} * M/\sqrt{p}$

SET radial law

For this derivation we will use the equivalent(below)

$Q = 4\pi R^2\sqrt{2GM/R_0}$

R= radius of emitting mass
Vescape = escape velocity at the surface given by $sqrt(2GM/R_0)$

Now lets assume emanation of space is hypothetically turn off for said mass the total volume of space would be

$Vo = 4/3*pi*R^3$

After a time t an additional volume of space is added using SET

$delta\ V = Q * t = Q = 4*\pi*R^2*Vescape * time$

Total volume of the expanded space becomes

Vtotal = Vo + delta V = **$4/3*pi*R^3 + 4*\pi*R^2*Vescape*time$**

If we are to define the radius in the volume formula as R(t) as the radius of the emanated space after a time t we get:

$V_{total} = 4/3 * \pi * R(t)^3$

Now we equate both expressions:

$4/3 * \pi * R(t)^3 = 4/3 * pi * R^3 + 4 * pi * R^2 * Vescape * time$

Now we divide both sides by 4/3*pi and we get

$R(t)^3 = R^3 + 3R^2 * Vescape * time$

We take the cube root on both sides and get

$R(t) = (R^3 + 3R^2 * Vescape * time)^{\wedge}1/3$

From this relationship we can see how the radius of volume increases in respect to time due to emanation. The increment in the radius is not linear given rate of emanation is constant but the newly added space gets diluted over an expanded spherical surface causing the radial vertical outward speed of the emanation to slow down as it gets further. This is what causes the weakening of gravity with distance. To be clear because the new volume is diluted over an ever increasing surface area, the outward speed of the expansion measured at the effective surface diminishes with distance explaining both the weakening of gravitational effects with distance and the apparent deceleration of the local expansion rate, even though space is being created at a constant rate Q.

To capture the dynamic nature of space creation, we introduce a field S. Instead of only describing Q as a global flux, we define the space field S by the flux condition

$\iint S \cdot dA = Q(m^3/s)$, not to be confuse with $1/r^2$ electric field from a point charge

Assuming spherical symmetry for $r \geq R$ the integral becomes

$S(r) \cdot (4\pi r^2) = Q$

so that

$S(r) = Q/(4\pi r^2)$.

Because Q has units $m^3 s^{-1}$ and the area term $4\pi r^2$ is m^2, S carries units $m s^{-1}$: it is a radial speed field, not a force. In SET the relevant clock rate (time dilation) gradient is built from the escape speed field $V_{space}(r) = \sqrt{2GM/r}$, this Lorentz factor slope, not the diluted flux speed S(r), yields the observed acceleration.

L1 from SET's radial law, equal arrival.

We observe an L1 point between two orbiting masses. In SET this is the place where two emanation fronts clash. Start from the radial law: the front from a point mass M advances with local speed equal to escape speed. To illustrated better just think of Earth and the Sun having the flux/gravity turn on at the same time. L1 would be the point at which both fluxes meet. SET starts with physical cause. In Newtonian and GR models, tidal effects and L1 positions are consequences of assumed forces or curvature.
In SET, the L1 location arises directly from the behavior of a single fundamental entity, space flux/space emanation/mass driven expansion. Counterintuitively this causes the inward pull. To be explain in the following sections of the paper. In SET, L1 is not just a root of an effective potential, it is the neutral plane, where the Sun's and Earth's emanation fronts equalize arrival, canceling the time dilation gradient and extinguishing the emergent gravitational pull.

SET radial law

$R(t) = (R(0)^3 + 3R(0)^2 * Vescape(R(0)) * time)^{1/3}$

SET gives you how the front moves in a small time step dt, meaning in the next instant, the cube of the radius increases by $3R^2 * V_{escape} * dt$.

$R(t + dt) = (R(t)^3 + 3 R(t)^2 * Vescape(R(t)) * dt)^{(1/3)}$

Cube both sides and subtract $R(t)^3$:

$R(t + dt)^3 - R(t)^3 = 3 R(t)^2 * Vescape * dt$

When dt is very small, the left side, change in R^3 over dt becomes a time derivative:

$d(R^3)/dt = 3 R(t)^2 * V_{escape}$

Use the chain rule identity. We know
$d(R^3)/dt = 3 R(t)^2 * dR/dt$

So we equate the two right hand sides

$3 R(t)^2 * dR/dt = 3 R(t)^2 * Vescape$

Cancel the common factor for $R(t) > 0$

$dR/dt = Vescape(R(t))$

This is the differential law coming from the radial law. The instantaneous radial speed of the front equals the escape speed at that radius, written in continuous form.

In SET we use the escape speed driver

$Vescape(R) = sqrt(2 G M / R)$

So the ODE is

dR/dt = sqrt(2 G M / R)

Time of reach, continuous form of the update law

τ(R) = (2/3) * R^(3/2) / sqrt(2 G M)

Two masses facing each other

Place the Sun at x = 0 and the Earth at x = D (with D ≈ 1 AU).

x is the distance from Earth toward the Sun where the fronts meet.

Equal arrival condition

τ_sun(D – x) = τ_earth(x).

Substitute and cancel constants

(D – x)^(3/2) / sqrt(M_sun) = x^(3/2) / sqrt(M_earth)

→ (D – x)/x = (M_sun / M_earth)^(1/3).

Solve for x

x_equal = D / [1 + (M_sun / M_earth)^(1/3)].

Apply to Sun–Earth

Mass ratio M_sun / M_earth ≈ 3.33×10^5 → cube root ≈ 70.0.

So x_equal ≈ D / (1 + 70) = 0.01408 D.

With D = 1 AU = 1.496×10^8 km:

x_equal ≈ 0.01408 × 1.496×10^8 km ≈ 2.11×10^6 km (from Earth, Sun-ward).

Compare to observed/classical

L1 (Sun–Earth) ≈ 1.50×10^6 km from Earth.

So the pure equal-arrival estimate is too Sun ward by (2.11 – 1.50)/1.50 ≈ 41%.

Adding rotation in SET: orbital trajectory

Because Earth is traveling around the Sun at 29,784 m/s, we cannot apply the radial law directly, because Earth's flux does not follow a perfectly straight path toward the Sun. Instead, its outward propagation needs to lean sideways If I may to keep up with Earth's orbital rotation. This makes the trajectory diagonal, effectively lengthening the path that the flux must travel.

Therefore, the radial law must be slightly tweaked to include orbital motion.

Starting from the SET radial law:

$R(t) = (R^3 + 3R^2 \cdot Vescape \cdot time)^{(1/3)}$

Here, Vescape is the outward flux driving speed directly away from the mass, assuming the target mass is stationary relative to the emitter. That is only true when Vorbital = 0.

So for two masses that are not orbiting,

Vescape ≡ Vradial

But if the emitter is orbiting, then the flux must also carry a sideways velocity just to remain aligned along the Sun-Earth line.

SET allows us to express this requirement through an invariant:

$c^2 = Vspace^2 + Vtime^2$ (root SET invariant)

and at the local flux level we apply a similar velocity budgeting:

$Vescape^2 = Vradial^2 + Vsideways^2$

Earth's sideways speed is exactly what keeps the Sun–Earth line rotating, so:

$Vsideways = \Omega R$

where
$\Omega = Vorbital / D$ is Earth's angular orbital speed
R is the radial distance the flux has already traveled from Earth
D is the Earth Sun separation

Putting this into the invariant:

$Vescape^2 = Vradial^2 + (\Omega R)^2$

So solving for the effective radial flux:

$Vradial = \sqrt{(Vescape^2 - (\Omega R)^2)}$

Then the modified SET radial law becomes simply:

$R(t) = (R^3 + 3R^2 \cdot Vradial \cdot time)^{(1/3)}$
$Vflux = \sqrt{(2GM/R - (\Omega R)^2)}$

L1 from SET's radial law (equal arrival with Earth's orbital motion)

We keep the Sun side as before, no rotation on the Sun term for this local, near Earth estimate, and we only modify the Earth side because Earth is orbiting.

D = Sun Earth separation (≈ 1 AU).
x = distance from Earth toward the Sun to the meeting point (Sun-side distance is D – x).
$\Omega = Vorbital / D$.

Earth side, use the same update form but with the flux budget:
$Vescape^2 = Vradial^2 + (\Omega R)^2 \rightarrow Vradial(R) = sqrt(2 G M_earth / R - \Omega^2 R^2)$.

Time to reach x from Earth

Start from the escape time formula t_escape(R) = (2/3) R^(3/2) / sqrt(2 G M).

Include rotation on the Earth side as a small correction ($\Omega^2 x^3 \ll 2 G M_{earth}$):

$t_{earth,rot}(x) \approx (2/3)\, x^{3/2} / \sqrt{2 G M_{earth}} \cdot [\, 1 + \Omega^2 x^3 / (12 G M_{earth}) \,]$.

Sun side (same as before, no rotation)
$t_{sun}(D - x) = (2/3)\, (D - x)^{3/2} / \sqrt{2 G M_{sun}}$.

Equal arrival condition
Set $t_{sun}(D - x) = t_{earth,rot}(x)$:

$(2/3)\, (D - x)^{3/2} / \sqrt{2 G M_{sun}}$
$= (2/3)\, x^{3/2} / \sqrt{2 G M_{earth}} \cdot [\, 1 + \Omega^2 x^3 / (12 G M_{earth}) \,]$.

Cancel the common $(2/3)/\sqrt{2 G}$:
$(D - x)^{3/2} / \sqrt{M_{sun}}$
$= x^{3/2} / \sqrt{M_{earth}} \cdot [\, 1 + \Omega^2 x^3 / (12 G M_{earth}) \,]$.

Near Earth approximation and circular orbit identity
For $x \ll D$, we replace $(D - x)$ by D on the Sun side factor.
Then use $\Omega^2 D^3 = G M_{sun}$,circular orbit.
Solving to first order in the small correction gives a clean multiplicative fix to the no rotation result:

$x_{with_rotation} \approx x_{equal} \cdot 3^{-1/3}$.

So the final closed form is
$x_{with_rotation} = D \cdot (M_{earth} / (3 M_{sun}))^{1/3}$.

Calculation
From Part 1, $x_{equal} \approx 2.11 \times 10^6$ km.
Multiply by $3^{-1/3} \approx 0.693$:

$x_{with_rotation} \approx 1.46 \times 10^6$ km,

which is essentially the classical Sun–Earth L1 $\approx 1.50 \times 10^6$ km.

What I like about this solution is that the tidal/rotation physics in classical celestial mechanics falls out of SET, not the other way around. It seems the hypothesis pans out mathematically for this case. With the rotation-aware radial law, L1 is the point between two masses where the gravitational pulls balance, lands at the same location as the point where the two emanation fronts fluxes clash. Sitting at that point, neither mass can insert a net time dilation gradient on you, such that you avoid the differential pull/stress in either direction. So SET claim that L1 is where space emanation fronts meet and cancel net time dilation gradient is mathematically grounded.

Bear in mind that Earth's flux speed is not reduced in an absolute sense. The modification to Vflux comes entirely from the geometry of the path. Because Earth is in motion/orbiting, the emanation front must travel a diagonal route to stay aligned with the Sun–Earth line. What

changes is the effective outward velocity component of the flux when measured in the direction of the Sun, not the total speed of the flux itself.

In SET I believe in forces, but only when properly place in the causality chain. Flux comes first, gradient second, and force emerges as a consequence. In SET, gravity is not a mysterious pull, it is simply matter reacting to the gradient created by emanated space. Flux → Gradient → Force.

Observer-frame flux counting (proper time vs. coordinate time)

Conserved flux (coordinate time):
In SET the global volumetric emission of space by a mass M is a conserved scalar in distant/coordinate time t:
$Q = dV/dt$ $[m^3/s]$.

Proper-time ticking:
A local observer at radius r, moving with speed v relative to the static frame, has
$\alpha(r) = \sqrt{(1 - 2GM/(r c^2))}$, $\gamma(v) = 1/\sqrt{(1 - v^2/c^2)}$, $d\tau/dt = \alpha/\gamma$.

The same conserved Q is therefore tallied per proper second as
$dV/d\tau = Q \cdot dt/d\tau = Q \cdot (\gamma/\alpha)$.

Geometric dilution (speed field):
$S(r) = Q / (4\pi r^2)$ $[m/s]$.
Proper-time readout:
$S_{proper}(r, v) = S(r) \cdot (\gamma/\alpha) = [Q/(4\pi r^2)] \cdot (\gamma/\alpha)$.
(If the observer has a radial component of motion, small kinematic corrections from velocity addition can enter; the γ/α factor covers the dominant clock effect.)

The emitted flux Q and the escape-speed field $V_{space}(r) = \sqrt{(2GM/r)}$ are invariant, only the counting per tick changes. In strong field ($\alpha < 1$) and/or at high speed ($\gamma > 1$), one proper second contains more coordinate time, so the same Q appears larger per τ. This is a readout effect, not an increase of the source's emission.

Gravity from the lapse gradient (not from $\nabla|S|$):
The inward proper acceleration for a hovering observer is set by the time dilation slope, $a(r) = c^2 \cdot d/d\ell\ [\ln \alpha(r)]$, with $d\ell = dr/\alpha(r)$.
In the weak field this reduces to $a \approx GM/r^2$. Do not build α from $S(r) = Q/(4\pi r^2)$; α(r) comes from the escape-speed driver $V_{space}(r)$ (or, generally, from the elliptic law $\nabla\cdot(\alpha\nabla\alpha) = (4\pi G/c^2)\rho$ with $\alpha \to 1$ at infinity).

Black hole dilution example:
Take $Q = 4\pi R_s^2 c$. Then
$S(r) = Q/(4\pi r^2) = R_s^2 c / r^2 = (4 G^2 M^2)/(c^3 r^2)$,
a velocity field (m/s) that records the conserved flux locally (radial). This mirrors Gauss's-law–type $1/r^2$ spreading, but note the dimensional difference: g is m/s^2, S is m/

s. Gravity itself is tied to the lapse α via the lapse gradient $g = c^2 \nabla \ln \alpha$, not directly to $\nabla|S|$.

General mass distribution driver vs. flux.
Let ρ(r) be the density and
$m(r) = \int_0^r 4\pi s^2 \rho(s)\, ds$, $V_{space}(r) = \sqrt{2G\, m(r)/r}$.
On a spherical source surface R (outside the matter), the calibration identity is
$Q = 4\pi R^2 V_{space}(R)$.
Use this only on the source boundary R to relate Q and GM. Do not attempt to construct Q by integrating V_space over shells; in SET the flux is fixed by Axiom 1,
$Q = \iiint \sqrt{(24\pi G \rho)}\, d^3x$.

Bubble growth law and time of reach.
Define the effective radius R(t) of the emitted bubble by $V(t) = (4/3)\pi R(t)^3$. With constant Q,
$dV/dt = 4\pi R(t)^2 \cdot dR/dt = Q \rightarrow R(t)^3 = R^3 + 3 R^2 V_{space}(R) \cdot t$,
where R is the source surface and $V_{space}(R) = \sqrt{2GM/R}$ (or c at a horizon). Thus
$R(t) = [R^3 + 3 R^2 V_{space}(R) \cdot t]^{(1/3)}$,
$t = (R_{observer}^3 - R^3) / [3 R^2 V_{space}(R)]$.
Re-arranged,
$V_{space}(R) = (R_{observer}^3 - R^3) / (3 R^2 t)$.
Keep the denominator evaluated at the source surface R (for a black hole, R = R_s and $V_{space}(R_s) = c$).

Geometric lesson at fixed altitude.
Stand the same proper distance above two horizons. The larger R_s acts as a wider nozzle: with $S(r) = Rs^2 c / r^2$, dilution is weaker, so more residual speed persists at the same offset than for a smaller Rs. Hence stronger pull farther out, purely geometric dilution, consistent with the causal cap $|S| \le c$. This is consistent with strong field calculations.

Horizon Geometry scaling

Circumference = $2\pi R_s$.

If the emitted shell expands at c just outside the horizon,
$R(t) = R_s + c \cdot t$.

Then
$C(t) = 2\pi(R_s + c \cdot t)$,
$C(t)/C_0 = [2\pi(R_s + c \cdot t)] / (2\pi R_s) = (R_s + c \cdot t)/R_s = 1 + (c \cdot t)/R_s$.

So the dimensionless “circumference factor” is
$circumference_factor = 1 + (c \cdot t)/R_s$.

Test with two black holes:

R_s,a = 100 m, R_s,b = 10000 m.
Both observers sit an offset d = 1000 m above their respective horizons (same coordinate offset).
Choose t so that c·t = d → t = d/c.
Then
circumference_factor$_a$ = 1 + d/R_s,a = 1 + 1000/100 = 11,
circumference_factor_b = 1 + d/R_s,b = 1 + 1000/10000 = 1.1.

A smaller horizon acts like a narrow nozzle: its flux spreads over a much larger annulus after the same offset d, so the radial speed falls faster (stronger dilution). A super-massive horizon is a wider nozzle: weaker geometric fanning, higher residual $\bar{S}$ at the same d. (Note: "pull" is set by the lapse gradient; at the same proper altitude the hover acceleration is $\approx c^2/\ell$, essentially independent of R_s, while tidal gradients scale $\propto 1/R_s^2$.)

In SET, gravity originates from continuous space emanation. For ordinary bodies the outward surface speed depends on M/R; for horizons it is capped at c, turning the horizon into a fixed rate nozzle. The larger horizon exhibits weaker dilution of $\bar{S}$ at the same coordinate offset (higher residual drift), consistent with the causal cap $|S| \le c$.

Integrated driver vs. flux bookkeeping

Escape-speed (lapse driver):
$V_{space}(r) = \sqrt{(2\,G\,m(r)/r)}$, with $m(r) = \int_0^r 4\pi\, s^2\, \rho(s)\, ds$.

Flux bookkeeping field:
$S(r) = Q / (4\pi r^2)$.

Flux–mass law (Axiom 1; use this to compute Q):
$Q = \iiint \sqrt{(24\pi G\, \rho)}\, d^3x$
(spherical: $Q = 4\pi \int_0^R r^2 \sqrt{(24\pi G\, \rho(r))}\, dr$).

Spherical calibration at the source surface R (Axiom 3):
$\bar{S}(R) = Q/(4\pi R^2) = V_{space}(R) = \sqrt{(2\,G\,M / R)}$.

Do not write $dQ = V_{space}(r) \cdot 4\pi r^2\, dr$.
That would give the wrong units (m^4/s). The correct per shell contribution from Axiom 1 is
$dQ = \sqrt{(24\pi G\, \rho(r))} \cdot 4\pi r^2\, dr$.

With these definitions, $\bar{S}(R) = Q/(4\pi R^2)$ equals the escape speed at the source surface iso-flux/source surface Σ, while $S(r) = Q/(4\pi r^2)$ for $r > R$ is just the geometric dilution of the conserved flux. Gravity itself is set by the lapse gradient built from $V_{space}(r)$, not by $\nabla|S|$.

The Speed Time Dilation Gradient and Inward Pull as a result of volumetric flux emanated by mass

SET interprets gravity/emanation/expansion as the cause of what is usually called gravitational time dilation. Operationally, the only physical "field" effect on matter is a time-dilation gradient across bodies. Because the conserved flux Q geometrically dilutes as $1/r^2$, any extended object at radius r sees stronger time dilation on its inner hemisphere (closer to the source) than on its outer hemisphere. This differential can be viewed as internal stresses that bias motion toward the side of slower proper time.

In SET we keep the roles clean:
Flux bookkeeping: $S(r) = Q/(4\pi r^2)$ [m s^{-1}].
Gravity driver (lapse): built from the escape-speed field $V_{space}(r) = \sqrt{(2 G M / r)}$, not from S.

Hovering clock rate (gravitational lapse)

Define the gravitational lapse
$\alpha(r) = \sqrt{(1 - 2 G M/(c^2 r))}$.

For a hovering observer (v = 0),
$d\tau/dt = \alpha(r)$.

For a moving observer with local speed v,
$d\tau/dt = \alpha(r)/\gamma(v)$, with $\gamma(v) = 1/\sqrt{(1 - v^2/c^2)}$.

Time-dilation gradient

Differentiate $\alpha(r)$:
$d\alpha/dr = [G M/(c^2 r^2)] \cdot 1/\alpha$.

Hence
$d/dr [\ln \alpha] = (1/\alpha) \cdot d\alpha/dr = [G M/(c^2 r^2)] \cdot 1/\alpha^2$.

Proper radial distance is $d\ell = dr/\alpha$, so the inward (hover) acceleration is
$a(r) = c^2 \cdot d(\ln \alpha)/d\ell$
$= c^2 \cdot \alpha \cdot d/dr [\ln \alpha]$
$= G M / [r^2 \cdot \alpha]$.

Vector form:
$g(r) = - [G M / (r^2 \cdot \alpha)] \hat{r} \rightarrow -(G M/r^2) \hat{r}$ in the weak field ($\alpha \rightarrow 1$).

Interpretation (internal gradient picture)

Across a body of radial thickness Δr at radius r, the clock rate difference is
$\Delta[d\tau/dt] \approx \{ [G M/(c^2 r^2)] / \sqrt{(1 - 2 G M/(c^2 r))} \} \cdot \Delta r$,
so the inner side ages more slowly. SET's interpretation is that motion toward smaller r reduces this internal time-rate mismatch; mathematically this is the same direction picked out by $-\nabla \ln \alpha$.

Orbit as gradient cancellation

In circular motion, kinematic time dilation adds an opposing gradient across the body (outer rim faster than inner rim). In the weak-field/slow-motion limit, balancing the two gradients yields
$v^2/r = G M/r^2 \rightarrow v = \sqrt{(G M/r)}$.
Thus orbital speed cancels the inward lapse gradient, giving stress-free circular free fall (proper acceleration = 0).

$S(r)$ has units m s^{-1} and encodes geometric dilution of the conserved volumetric flux Q (m^3 s^{-1}).
$\alpha(r)$ is dimensionless and governs all gravitational clock/acceleration effects.
$V_space(r) = \sqrt{(2 G M / r)}$ (m s^{-1}) is the lapse driver; plugging it into α reproduces the standard Schwarzschild lapse: $\alpha(r) = \sqrt{(1 - 2 G M/(c^2 r))}$.

Orbital Velocity

In standard physics, for a circular orbit, the gravitational force provides the centripetal force that keeps the object moving in a circle. In SET, orbital motion is a dynamic cancellation between two opposing time dilation gradients. When a body moves exactly at the circular-orbit speed:

Gravitational force = Centripetal force
$G M / r^2 = v^2 / r$

This velocity defines the speed at which the object's center orbits the massive body.

Gravitational time dilation occurs because time runs slower in stronger gravitational fields. The lapse (gravitational clock-rate factor) is:
$\alpha(r) = d\tau/dt = \sqrt{(1 - 2 G M / (c^2 r))}$

For our orbiting object:
Inner part ($R = r - \Delta r/2$): closer to the central mass; stronger field; time runs slower.
Outer part ($R = r + \Delta r/2$): farther from the mass; weaker field; time runs faster.
Here Δr is the object's size (inner to outer side).

For small Δr, the difference in gravitational time dilation across the object is approximately:

$\Delta(d\tau/dt)_{grav} \approx [\, G M / (c^2 r^2) \,] \cdot [\, 1 / \sqrt{(1 - 2 G M/(c^2 r))} \,] \cdot \Delta r$
(weak-field limit $\rightarrow \approx (G M/(c^2 r^2)) \cdot \Delta r$)

Speed-induced (special-relativistic) time dilation occurs because time slows for faster motion:
$d\tau/dt = \sqrt{(1 - v^2 / c^2)}$

In orbit, the outer side traces a slightly larger path than the inner side at essentially the same angular rate, so the outer side moves slightly faster and its clock runs slightly slower. Using the center's orbital speed $v \approx \sqrt{(G M / r)}$ for a first-order estimate, the differential is:
$\Delta(d\tau/dt)_{speed} \approx - (v^2 / c^2) \cdot (\Delta r / r)$

Total time-dilation differential. Combine both effects:
$\Delta(d\tau/dt)_{total} = (G M/(c^2 r^2)) \cdot [\, 1 / \sqrt{(1 - 2 G M/(c^2 r))} \,] \cdot \Delta r - (v^2 / c^2) \cdot (\Delta r / r)$

Substitute the circular-orbit condition $v^2 = G M / r$:
$\Delta(d\tau/dt)_{total} = (G M/(c^2 r^2)) \cdot [\, 1 / \sqrt{(1 - 2 G M/(c^2 r))} \,] \cdot \Delta r - (G M/(c^2 r^2)) \cdot \Delta r$

In the weak-field regime ($\sqrt{(1 - 2 G M/(c^2 r))} \approx 1$), these terms cancel to leading order:
$\Delta(d\tau/dt)_{total} \approx 0$

Thus, at the orbital speed $v = \sqrt{(G M / r)}$, the gravitational(kinematic in SET due to emanation, space moves through mass) and speed-induced time-dilation(mass moves through space) differences cancel: the net time-dilation gradient across the body vanishes. Physically, if the object moves slower than this speed, the gravitational gradient dominates (the inner side lags more), producing a net inward pull. If it moves faster, the speed-induced effect would dominate. At the precise circular-orbit speed, the gradients balance.

In the previous section's a(r) describes the proper hover acceleration (stationary observer). In a circular free fall orbit the proper acceleration is zero; the cancellation here refers to the internal time dilation gradient across the body, not to a nonzero proper acceleration.

In SET, where gravity is tied to space emanation and time dilation, this balance provides a mechanism for orbital stability, the time dilation gradient drives motion inward unless counteracted by orbital speed. A free fall circular orbit is therefore a state of zero net internal stress. The body neither drifts inward nor outward because its center of mass feels no residual time dilation tug.

Axiom 1 – Flux–Mass Continuity

Fields.
Flux 4-vector $F^\mu = (V_{time}, S^i)$, where S is the space-speed field [m s^{-1}].
Matter current $J^\mu = \rho_0 u^\mu$, with $u_\mu u^\mu = c^2$ and ρ_0 the rest-mass density.

Define the Lorentz-scalar source $n \equiv \sqrt{(J_\mu J^\mu)}/c = \rho_0$.

Covariant law.
$\nabla_\mu F^\mu = \sqrt{(24 \pi G)}\, n.$ $[s^{-1}]$

Static reduction.
In the matter rest frame ($u^\mu = (c,0)$) and for time-independent configurations ($\partial_t V_{time} = 0$):
$\nabla \cdot S = \sqrt{(24 \pi G \rho)}.$ $[s^{-1}]$

Driver of inward pull.

Axiom 1 (static reduction)

$\nabla \cdot S = \sqrt{(24\pi G \rho)}$ $[s^{-1}]$.

Squaring: $(\nabla \cdot S)^2 = 24\pi G \rho \;\rightarrow\; (\nabla \cdot S)^2/(3c^2) = (8\pi G/c^2) \rho$.

Vector identity (smooth α)

$\nabla^2(\alpha^2) = \nabla \cdot (2\alpha \nabla \alpha) = 2\nabla \cdot (\alpha \nabla \alpha)$.

Lapse PDE (local “source” form)

$\nabla \cdot (\alpha \nabla \alpha) = (4\pi G/c^2) \rho \;\rightarrow$ using the identity above,

$\nabla^2(\alpha^2) = 2(4\pi G/c^2) \rho = (8\pi G/c^2) \rho$.

Therefore, combine the last two lines:

$\nabla^2(\alpha^2) = (8\pi G/c^2) \rho = (\nabla \cdot S)^2/(3c^2)$.

Gravity driver

The inward acceleration is set by the lapse gradient. With outward positive radial line element $d\ell$,

$a_r = -c^2\, d/d\ell\, [\ln \alpha]$.

Magnitude (weak-field limit): $|a| \approx GM/r^2$.

The PDE above to build α from ρ, I do not substitute a surface average $\bar{S} \propto Q/A_{eff}$ into $(\nabla \cdot S)$. Do not apply this in time dependent settings, use ρ explicitly via $\nabla^2(\alpha^2) = (8\pi G/c^2) \rho$. The purpose of the substitution was merely to show that combining the lapse PDE with Axiom 1 gives

Axiom 1 (static): $\nabla \cdot S = \sqrt{(24\pi G \rho)}$.

Lapse PDE: $\nabla\cdot(\alpha\nabla\alpha) = (4\pi G/c^2)\,\rho$ and identity $\nabla^2(\alpha^2) = 2\nabla\cdot(\alpha\nabla\alpha)$.

Therefore $\nabla^2(\alpha^2) = (8\pi G/c^2)\,\rho = (\nabla\cdot S)^2/(3c^2)$, hence

$3\nabla^2(\alpha^2) = (\nabla\cdot S)^2/c^2$.
(This note is for me for later exploration.)

Axiom 2 – Unit timelike constraint

$F\cdot F = c^2$.
Interpretation (local): at each spacetime point, $c^2 = |S(x)|^2 + V_{time}(x)^2$. Hence $|S| \le c$ everywhere; a horizon occurs where $|S| \to c$ and $\alpha \equiv V_{time}/c \to 0$.
Let $n \equiv \sqrt{p}$ be the positive scalar with $n^2=p$ in the matter rest frame. In SET time dilation does not boost coordinate flux.

Velocity is measured by observers comoving with the timelike congruence of F^μ

Surface average diagnostic (fixed surface Σ):
Define the flux capacity $Q_{set}(\Sigma) = A_{eff}(\Sigma)\cdot c$ and the compactness $\chi_\Sigma = (Q / Q_{set}(\Sigma))^2$. On that same fixed Σ you may write the surface-average identity $c^2 = (Q / A_{eff})^2 + V_{time,avg}^2$, equivalently $\bar{\alpha}_\Sigma = \sqrt{1 - \chi_\Sigma}$.
I use this only as a diagnostic on that Σ. It is not a second invariant and generally differs from the local $\alpha(x)$.

One surface calibration (spherical source surface R_0 only):
On the physical source sphere R_0, Axiom 3 gives $S(R_0) = \sqrt{2GM/R_0} = Q / (4\pi R_0^2)$.
Trading $GM \leftrightarrow (Q, R_0)$ once,

$GM = Q^2 / (32\,\pi^2 R_0^3)$.
I insert that into the standard spherical lapse to get the exterior field:

$\alpha(r) = \sqrt{1 - 2GM/(c^2 r)} = \sqrt{1 - [Q^2/(16\,\pi^2 R_0^3 c^2)]\cdot 1/r}$

$\alpha(r) = \sqrt{1 - \chi_0\cdot R_0/r}$ with $\chi_0 \equiv (Q/Q_{set}(R_0))^2$.

Unified action (with nonlinear $\sqrt{\rho}$ source)

Let $M_{\mu\nu} \equiv \nabla_\mu F_\nu - \nabla_\nu F_\mu$. Let n be the invariant rest-density scalar (in the matter rest frame $n \to \sqrt{\rho}$).
$L = -1/4\, M_{\mu\nu} M^{\mu\nu} + \lambda\,(F_\mu F^\mu - c^2) + \eta\,(\nabla_\mu F^\mu - \sqrt{(24\pi G)}\, n)$.
Action: $S = \int d^4x \sqrt{(-g)}\, L$.
Variations:
$\delta\lambda \to F_\mu F^\mu = c^2$ (Axiom 2).

δη → ∇_μ F^μ = √(24πG) n (Axiom 1, differential form).
δF^μ → ∇_ν M^{νμ} + ∇^μ η + 2λ F^μ = 0 (dynamics; η supplies the longitudinal part).

Driver of gravity from Axiom 2 (derivation)

Define the lapse α ≡ V_time/c (0 < α ≤ 1). A free particle's proper time is
dτ = α(x) · sqrt(1 − v²/c²) · dt, with γ ≡ 1/sqrt(1 − v²/c²).
The particle action S_p = −m c² ∫ dτ gives the Lagrangian L = −m c² α(x) sqrt(1 − v²/c²).

Euler Lagrange:
p = ∂L/∂v = m α γ v
∂L/∂x = −m c² sqrt(1 − v²/c²) ∇α → d/dt (m α γ v) = −m c² sqrt(1 − v²/c²) ∇α.

Hover limit (v → 0, γ → 1): p ≈ m α v → α a = −c² ∇α ⇒ a = −c² ∇ln α.
Along the radial proper line dℓ = dr/α, the driver is g(r) = c² · d/dℓ [ln α(r)].

Obtaining α (two safe routes):
Solve the lapse equation: ∇·(α ∇α) = (4πG/c²) ρ with α → 1 at infinity.
Spherical, exterior vacuum via one-surface calibration at R_0:
use GM = Q²/(32 π² R_0^3) to get
α(r) = sqrt(1 − [Q²/(16 π² R_0^3 c²)] · 1/r)
and g(r) = GM/(r² α) ≈ GM/r² in the weak field.

Do not set α = sqrt(1 − $\bar{S}$(r)² / c²) with $\bar{S}$(r) = Q/A_eff(r). That produces an unphysical r^{-5} falloff and violates the lapse equation. Replacing |S| with $\bar{S}$ mixes a global average into a law. $\bar{S}$ is not the S that enters F·F = c², because $\bar{S}$(r) ≡ Q / A_eff(r) is a surface average throughput on a chosen Σ(enclosing shell)

Axiom 3 – Emanation Mass Coupling

For any static, spherically symmetric source of mass M with surface radius R_0 (the fixed physical source radius used for calibration), the outward space-speed at the surface equals the escape speed, and the total flux is area times that speed:
S(R_0) = sqrt(2GM/R_0) m/s^{-1}
Q = $\oint\!\!\oint_{r=R_0}$ S·dA = 4π R_0^2 S(R_0) = 4π R_0^2 sqrt(2GM/R_0) [m^3 s]
(Do not replace R_0 → r inside these identities.)

Gauge redundancy. F_μ → F_μ + ∂_μχ leaves M_{μν} unchanged, so only S and Q are physical. This boundary condition fixes the single integration constant when solving the

field equation in a given geometry and, by matching a uniform sphere, selects the coefficient $\sqrt{(24\pi G)}$ in the static law $\nabla\cdot S = \sqrt{(24\pi G\,\rho)}$.

Corollaries of Axioms 1–3 (no new postulates)

Flux cap (theorem). From $|S| \le c$ (Axiom 2) and the divergence theorem, any sphere of radius R obeys
$Q \le 4\pi R^2 c$.
Equality marks a horizon ($|S| \to c$ on that sphere).

Mean density bound (theorem). Volume-average Axiom 1 on a sphere and use $Q \le 4\pi R^2 c$:
$\langle \nabla\cdot S \rangle = Q / ((4/3)\pi R^3) \le 3c/R$.
With $\langle \nabla\cdot S \rangle = \mathrm{sqrt}(24\pi G\,\bar{\rho})$ this gives
$\bar{\rho} \le 3c^2 / (8\pi G R^2)$.

Compactness and time dilation (definition + identity). Define the capacity on the spherical source surface
$Q_set(R_0) \equiv 4\pi R_0^2 c$,
and the dimensionless compactness
$\chi_0 \equiv (Q / Qset(R_0))^2$.
Under the spherical Axiom-3 calibration one finds
$\chi_0 = 2GM / (R_0 c^2)$,
hence the gravitational time dilation (surface "time stretch") is
$\gamma_g(R_0) = 1 / \mathrm{sqrt}(1 - \chi_0) = 1 / \mathrm{sqrt}(1 - 2GM / (R_0 c^2))$.
(Equivalently, the surface lapse is $\alpha(R_0) = 1/\gamma_g(R_0) = \mathrm{sqrt}(1 - \chi_0)$.)

Uniform-sphere calibration. For constant ρ, Axiom 1 gives $\nabla\cdot S = \mathrm{const}$; integrating over the ball yields
$Q = (4/3)\pi R^3 (\nabla\cdot S) = 4\pi R_0^2\, \mathrm{sqrt}(2GM/R_0) \;\Rightarrow\; \nabla\cdot S = \mathrm{sqrt}(24\pi G\,\rho)$ [s^{-1}].

Flux mass law (SET, integral form)

$\iint_{(}\Sigma_{)} S\cdot dA = \iiint_{(}V_{)} \sqrt{(24\pi G\,\rho)}\, d^3x$ [$m^3\, s^{-1}$]

Here Σ is a closed surface (Σ = ∂V= 2D closed surface that encloses it) enclosing the baryons and V its volume; S(x) is the outward space-flux vector [$m\, s^{-1}$]; ρ(x) the rest-frame mass density [$kg\, m^{-3}$]; G Newton's constant; dA and d^3x are area and volume elements. The flux $Q \equiv \iint_{(}\Sigma_{)} S\cdot dA$ is surface independent by the divergence theorem (equivalently, $Q = \iiint_{(}V_{)} \sqrt{(24\pi G\,\rho)}\, d^3x$). With $A_eff \equiv \iint_{(}\Sigma_{)} dA$ (purely geometric), the area mean speed is $\bar{S}_\Sigma = Q/A_eff$ m/s^{-1}, giving $V_esc,\Sigma = \bar{S}_\Sigma$ and $V_orb,\Sigma = \bar{S}_\Sigma/\sqrt{2}$ (weak-field readout).

Gravity is driven by α via $g = -c^2 \nabla \ln \alpha$, with α obtained from the lapse equation or the calibrated spherical solution.

SET “q” kernel (per steradian flux)

SET’s q-kernel shows that expansion and gravity are inherent properties of mass. Even without writing the full geometry, a single cubic meters per second quantity can drive accurate calculations. The kernel does not compute the global flux by itself; it gives the local per-steradian generator evaluated on a fixed source surface R_0. This is the relevant building block that later gets read out through the effective area A_eff at the probe surface Σ.

Time-corrected (strong-field) form:
$q(R_0) = \mathrm{sqrt}(2\ G\ M\ R_0^3 / (1 - 2\ G\ M / (R_0\ c^2)))$

Weak-field form ($R_0 \gg R_s$):
$q(R_0) = \mathrm{sqrt}(2\ G\ M\ R_0^3)$

Earth check (weak field; matches observations):
Mass_earth = 5.972e24 kg
Radius_earth = 6.371e6 m
$q = \mathrm{sqrt}(2\ G\ M\ R^3) = 4.540e17\ m^3/s$
$V_{escape} = q / R^2 = 1.1186e4\ m/s$
$g = q^2 / (2\ R^5) = 9.81\ m/s^2$
$V_{orbital} = q / (\mathrm{sqrt}(2)\ R^2) = 7.910e3\ m/s$

Geometry factor for non-spherical emitters

The kernel q assumes the source is evaluated on a spherical surface. When the readout surface Σ is not spherical (e.g., a two-sided thin disk, an oblate shell), the throughput must be read via the effective area A_eff(Σ). A single linear factor captures this:
$f \equiv 4\pi\ R_0^2 / A_{eff}(\Sigma)$

Per-steradian kernel dressed by geometry:
$q_{eff} = f \cdot \mathrm{sqrt}(2\ G\ M\ R_0^3)$

For a two-sided thin disk, $A_{eff} \approx 2\pi R^2$ at radius R, so $f \approx 2$, and one gets the familiar boost when reading out speeds on the disk surface.

Readout at Σ (kinematics on the chosen surface):
$V_{esc}(\Sigma) = Q / A_{eff}(\Sigma)$, where $Q = 4\pi\ q(R_0)$ is the conserved total flux.
Using q_eff: $V_{esc} \approx q_{eff} / R^2$, $V_{orb} = V_{esc} / \mathrm{sqrt}(2)$.

Example (disc-like readout):
If you evaluate q on a spherical R_0 but read out on a two-sided disk at radius R, then
$f = 4\pi R_0^2 / (2\pi R^2) \rightarrow$ when $R \approx R_0$, $f \approx 2$
$V_{esc} \approx 2 \cdot \mathrm{sqrt}(2\ G\ M / R)$, $V_{orb} \approx \mathrm{sqrt}(2\ G\ M / R)$

which shows explicitly how the readout geometry changes the observed speed without adding dark matter.

Milky Way / Andromeda (flat rotation curves, geometry-only boost)

For a large, disk system, the spherical dilution embedded in the classical formulas under predicts speeds when you plug in a disk's baryons. In SET, you compute the global flux once from M on a fixed R_0:

$Q = 4\pi R_0^2 \cdot \mathrm{sqrt}(2 G M / R_0)$ (time-correct near compact objects)
$q(R_0) = Q / (4\pi) = \mathrm{sqrt}(2 G M R_0^3)$

Then you read out at the disk surface using $A_{eff}(\Sigma) \approx 2\pi R^2$ (or the oblate-shell formula B(e)):
$V_{esc}(R) = Q / A_{eff}(R) = [4\pi q(R_0)] / A_{eff}(R)$
For a razor-thin, two-sided disk: $V_{esc} \approx 2 \cdot \mathrm{sqrt}(2 G M / R)$, $V_{orb} \approx \mathrm{sqrt}(2) \cdot \mathrm{sqrt}(G M / R)$

This is the geometry-driven speed increase that flattens rotation curves with baryons only (no tuning, no modified G).

Why the kernel reproduces ϕ, g, and v_esc

Start with the weak-field kernel on the fixed source surface R_0:
$q \equiv \mathrm{sqrt}(2 G M R_0^3)$ [m^3/s per steradian]

If that flux emerges through each steradian's area R^2 at speed V_{esc}, then:
$V_{esc} = q / R^2 \rightarrow V_{esc}^2 = q^2 / R^4$

Take potential as work per unit mass to reach escape speed:
$\phi(R) = -\frac{1}{2} V_{esc}^2 = -\frac{1}{2} (q^2 / R^4)$

Since $q^2 = 2 G M R_0^3$, you recover:
$\phi(R) = - G M / R$,
$g(R) = -d\phi/dR = G M / R^2$,
and $V_{esc}(R) = \mathrm{sqrt}(2 G M / R)$.

Nothing was added beyond the kernel and the readout rule.

Why classical formulas under predict discs

Both $\phi(R) = -G M / R$ and $V_{esc} = \mathrm{sqrt}(2 G M / R)$ implicitly dilute M over $4\pi R^2$ (spherical assumption). Baryons/masses are organized as a thin, two sided emitter at large R, so reading the same global Q through $A_{eff} \approx 2\pi R^2$ naturally raises the local V_{esc} and V_{orb} without invoking dark matter. The kernel makes this explicit:

$q = Q / (4\pi) = \mathrm{sqrt}(2 G M R_0^3)$ (per steradian)
A_{eff} change $\rightarrow f \equiv 4\pi R_0^2 / A_{eff}(\Sigma)$
$q_{eff} = f \cdot \mathrm{sqrt}(2 G M R_0^3)$, $V_{esc} = q_{eff} / R^2 = f \cdot \mathrm{sqrt}(2 G M / R)$

For a two-sided disk ($A_{eff} = 2\pi R^2$), f = 2 and $V_{esc} = \mathrm{sqrt}(8 G M / R)$.

Where q comes from in the field equations (not an extra postulate)

Start from the SET continuity result (uniform-density check):

$Q = \iint S \cdot dA = \iiint \sqrt{}(24\pi G \rho)\, d^3x$

For a uniform sphere of radius R:
$Q = 4\pi \int_0^R \sqrt{}(24\pi G \rho)\, r^2\, dr = (4\pi/3) R^3 \sqrt{}(24\pi G \rho)$

Compact rewrite is equivalent:

Because $M = \rho \cdot (4/3)\pi R^3 \rightarrow (4/3)\pi R^3 = M/\rho$, we can write
$Q = (4\pi/3) R^3 \sqrt{(24\pi G \rho)} = (M/\rho) \sqrt{(24\pi G \rho)} = M \sqrt{(24\pi G / \rho)}$

Now substitute $\rho = M / ((4/3)\pi R^3)$:

$Q = M \sqrt{[24\pi G / (M / ((4/3)\pi R^3))]}$
$Q = M \sqrt{[24\pi G \cdot ((4/3)\pi R^3 / M)]}$

Combine the constants: $24\pi \cdot (4/3)\pi = 32 \pi^2$
$Q = M \sqrt{[(32 \pi^2) G R^3 / M]} = \sqrt{(32)} \pi \sqrt{(G M R^3)}$
Since $\sqrt{(32)} = 4\sqrt{2}$, this is
$Q = 4\pi \sqrt{(2 G M R^3)}$

Strip the 4π geometry to get the per steradian kernel:

$q \equiv Q / (4\pi) = \sqrt{(2 G M R^3)}$

So the correct chain is:
$Q = M \sqrt{(24\pi G / \rho)} = 4\pi \sqrt{(2 G M R^3)}$
$q = \sqrt{(2 G M R^3)}$
$q = \text{sqrt}(2 G M R^3 / (1 - 2 G M / (R c^2)))$

The q kernel is not an extra assumption, it is the inescapable consequence of Axioms 1, 3 plus the spherical calibration. The global flux is $Q = 4\pi q(R_0)$. The local speeds seen by an observer on Σ come from reading the same Q through the geometry $A_{eff}(\Sigma)$: $V_{esc}(\Sigma) = Q / A_{eff}(\Sigma)$, and $V_{orb} = V_{esc} / \text{sqrt}(2)$.I like the kernel because it cleanly separates readouts from drivers. Escape speed, and thus circular speed, is a readout: take the mass input, form the per-steradian kernel q on a spherical calibration surface R_0 so the global source strength is $Q = 4\pi \cdot q(R_0)$. Any enclosing surface Σ then reads the same Q through its geometry $A_{eff}(\Sigma)$: $V_{esc}(\Sigma) = Q/A_{eff}(\Sigma)$ and $V_{orb} = V_{esc}/\sqrt{2}$. That's pure geometric dilution.). So the picture is: Q carries the conserved source strength; A_{eff} distributes that strength into kinematic speeds; the lapse gradient supplies the dynamics. I'm not converting gravity into a number, I'm quantifying the source as a flux ($Q = 4\pi q$) and keeping geometry (A_{eff}) and dynamics ($\nabla \ln \alpha$) in their proper lanes.We now move on to, SET's predictive power on real systems

Derivation of Axiom 1

Among several hypotheses I was juggling at the time, I was thinking about how mass emanated space, which would make time dilation a unified phenomenon: whether you move through space or space moves through you, as what causes kinematic time dilation.

Under that postulate I needed a rate of emanation of space that would yield observable results. So I tied the velocity of the flux to the escape velocity at the surface of the Earth. It seemed reasonable since it yields a velocity from a classical formula, grounding my postulate to a magnitude determined by mass and radius.

So I looked up the formula for the volume of an sphere $V = 4/3\pi R^3$. And just putting two thoughts together determine that if space emanated from such sphere at I.e earth's surface then the new volume for that sphere would be $V = (4/3)\cdot\pi\cdot R^3. + \sqrt{2GM/R}$. Which yielded the wrong units because you cannot add a volume and a velocity. So I just added time to the formula given that time*velocity= distance. So the formula look like this:

$V_total = (4/3)\cdot\pi\cdot(R + V_esc\cdot t)^3$

At this point I thought well since I am thinking in terms of additional space produce by mass and using the excess outside its boundary/surface, if the hypothesis was true then I should be able to get reasonable results with that volumetric data. Since I'm interested in the excess (overflow) space outside the original boundary, I subtract the initial volume from V_total. After putting it together and simplifying it looked like this:

$\Delta V = (4/3)\cdot\pi\cdot[(R + V_esc\cdot t)^3 - R^3]$

I calculated how much new space earth would produce in one second

Numerically, for t = 1 s:
$G = 6.67430\times10^{-11}\ m^3/(kg\cdot s^2)$
$M\ (Earth) = 5.972\times10^{24}\ kg$
$R\ (Earth) = 6.371\times10^{6}\ m$
$V_esc = \sqrt{(2GM/R)}$
$\Delta V = 5.715593408\times10^{18}\ m^3.$

Which perplex me since it just seemed like a huge volume, and it made me doubt for a planck second that this idea was nonsense but I carried on with it

At that point, I decided to derive escape velocity from, so I then inverted the relation:

$Volume_emanated = 4/3\pi\ [(R+t\cdot(\sqrt{2GM/R})^3 - R^3]$ and call it a day. which lead me to

Given (emanated volume over time t):
$\Delta V = (4/3)\cdot\pi\ \cdot\ [\ (R + V_esc\cdot t)^3 - R^3\ ]$

Isolate the cube.
$(3/(4\pi))\cdot\Delta V = (R + V_esc\cdot t)^3 - R^3$

Move R^3 and take cube root.
$(R + V_{esc}\cdot t)^3 = R^3 + (3/(4\pi))\cdot\Delta V$
$\rightarrow R + V_{esc}\cdot t = [\ R^3 + (3/(4\pi))\cdot\Delta V\ ]^{(1/3)}$

Solve for V_{esc}.
$V_{esc} = (1/t)\cdot(\ [\ R^3 + (3/(4\pi))\cdot\Delta V\ ]^{(1/3)} - R\ )$

This looked horrible and just stressed me out. So I started to wonder. What would happen if earth emanated space for 1 second and cut off production. what would be the rate of thinning of this chunk of emanated space as it move outward out away from the surface, more specifically, with distance R would the gap between the outer and inner sphere decrease as the total fix volume is redistributed over a larger sphere. I was hoping the gap would close at the rate of $1/R^2$ as R from the surface increases. Because this would mean that the weakening of gravity could be explain with emanated space given that every mass/observer would have $1/R^2$ less space traversing him as you move away from the central mass (that is if one chunk of emanated space is produce, but since emanation is constant the rate every observer experiences is $Velocity_{space} = \sqrt{2GM/R}$, at every point but that is a different conversation). At this point I have never known or taken any physics so I just hoped this could explain something somehow.I just felt confidence this route could lead me to a solution that would help me debunk Dark Matter, and Dark Energy both with one hit. I did not know how but I just wanted to move forward.

So I made this little simple geometric formula to track the chunk thinning as it moved away.

$distance_{outer,inner} = Radius_{outer} - (\ Radius_{outer}^3 - (3\cdot Volume_{initial})/(4\pi)\ )^{(⅓)}$

and saw the thinning rate really falls off as an inverse square. I read up on inverse square laws and noted, among others,

Optical intensity (irradiance) from a point isotropic source:
$I(r) = P / (4\pi\ r^2)$ $(W\cdot m^{-2})$

And

$\Phi(r) = Q / (4\pi\ r^2)$ $(\text{per } m^2\cdot s)$

At this moment I am not doing derivations, just mainly reading about physics and formulas and running calculations using Spyder and Wolfram Alpha. Some

are so speculative I just dont want to share them. But among this calculations I used $\Phi(r) = Q / (4\pi r^2)$ (per $m^2 \cdot s$) replacing Q with the Volume I had calculated from earth. And I was able to retrieve the escape velocity of earth at every point. So I thought I am done, this is fine I already got my formula for calculating Volume of emanated space and Vescape (bare in mind the results were matching numerically, not units wise at this point) . But as I play around with $Vescape= Q/4\pi R_0^2$, I realize I could just write $\sqrt{2GM/R}= Q/4\pi$ which lead me to $Q=4\pi\sqrt{GMR_0^3}$.

Let me just say I am trying to make the story as short as possible because to be frank it took me a lot of looking at the ceiling and depression, and just testing a million things, to get to that.

Once I got $Q=4\pi\sqrt{GMR^3}$, I started doing a million derivations, calculations, and just pondering how would, an universe in which gravity and expansion are one and the same, work. But we will not get into that given that this section is call derivation of Axiom 1.

When I wanted to calculate the total size of the universe using $Q=4\pi\sqrt{GMR^3}$ I realized that I needed the formula to work using density instead of radius. For this I just derived R from the mass–density–radius relation for a uniform (constant density) sphere.

$\rho = M / V$ and $V = (4/3)\pi R^3$
$\rightarrow M = \rho \cdot (4/3)\pi R^3$
$\rightarrow R^3 = 3M / (4\pi\rho)$.

So I replace $R^3 = 3M / (4\pi\rho)$ in $Q = 4\pi\sqrt{2GMR^3}$ and got to $Q= \sqrt{24\pi G} * M/\sqrt{p}$

I found this formula to look elegant and appealing and I started using it for several calculations in galaxy clusters, expansion of the universe. And I was just running to stuff with it. It always struck me as that multiplying mass (M) * $\sqrt{24\pi G/\rho}$, would just get me accurate results when doing earth calculations among several other calculations. So I kept the factor $\sqrt{24\pi G/\rho}$ in mind all throughout the paper's development because it has a certain appeal.

Once I started doing the field equations I just thought that factor should be the center of Axiom 1 but the factor was not a rate, instead this resulted in $m^3 \cdot kg^{-1} \cdot s^{-1}$. So I did several versions of the paper, before getting back to this at which point I just started thinking about $\sqrt{((24\pi G)/\rho)}$ whether I should turn that into a rate and just call that Axiom 1, since it would be a rate expansion tie directly to mass and its density, which is what I was postulating. So I just did:

Start from Q (flux) formula
$Q = \sqrt{(24\pi G)} \cdot M / \sqrt{\rho}$ [Q has units m^3/s]

Substitute $M = \rho \cdot V$
$Q = \sqrt{(24\pi G)} \cdot (\rho V) / \sqrt{\rho} = \sqrt{(24\pi G)} \cdot \sqrt{\rho} \cdot V$

Divide by V to get a rate (per unit volume)
$Q/V = \sqrt{(24\pi G)} \cdot \sqrt{\rho} = \sqrt{(24\pi G \cdot \rho)}$ [units s^{-1}] This is the local creation rate per unit volume.

Interpret Q/V as the volume divergence of the space speed field S inside mass. With spherical symmetry I already use $S(r) = (Q/4\pi r^2)\,\hat{r}$, so outside matter $\nabla \cdot S = 0$. Inside a region with density $\rho(x)$, the uniform cell limit gives the local source is $\sqrt{(24\pi G\, \rho(x))}$. Thus, the field law:
$\nabla \cdot S = \sqrt{(24\pi G\, \rho)}$ [s^{-1}].

I am sorry to disappoint you if were expecting a more sophisticated derivation.

Anyhow, SET works, but physicist online just carved the formula on a stick and hit me in the head with it. Because I said gravity is the expansion of the universe itself. Why do I claim this? Why do I tie SET formulas which literally yield m^3/s explicitly to the expansion. I mean the math leads to that and the answer should be more than obvious. But lets take it an step further and tie SET to Friedmann solution for flat universe without curvature which is what I am claiming the universe is.

Early in the paper I calculate the expansion of the universe using

$Q = \sqrt{(24\pi G)} \cdot M / \sqrt{\rho}$ [Q has units m^3/s]

This formula gives me total volume of space per second so its results can be comfortably quoted for expansion calculations. If I were to calculate the velocity of the expansion/local expansion speed, base on the volumetric production we would just use SET's

$S(r) = Q / 4\pi r^2$ [S has units m/s]

Ok but lets say we do not want an outward velocity of expansion but rather just a rate of expansion. We just say $S(r)/r = Q / 4\pi r^3$ which is SET's H. Now to answer why do I connect gravity the expansion and SET claim that the universe is flat to classical solutions. For that we just simply replace the volume formula into Hset.

$V = (4/3)\pi r^3$ such that $r^3 = 3V / (4\pi)$

$Hset = Q / (4\pi(3V/4\pi)) = Q/ (3V)$

Since $M = p*V$, we derive $V = M/\rho$

Now we substitute that into $Hset = Q/ (3V)$,

$Hset = Q / (3(M/\rho)) = Q*\rho / (3M)$

Now we substitute, $Q = \sqrt{(24\pi G)} \cdot M / \sqrt{\rho}$ into, $Hset = Q*\rho / (3M)$

$Hset = [\sqrt{(24\pi G)} \cdot M / \sqrt{\rho}] \cdot \rho / (3\ M) = \sqrt{(24\pi G)}\ \sqrt{\rho}\ /3$

No we square $Hset = \sqrt{(24\pi G)}\ \sqrt{\rho}\ /3$

$Hset^2 = [24\pi G\rho] / 9 = ((8\pi G) /3) \cdot \rho$

$Hset^2 = ((8\pi G) /3) \cdot \rho$

Shorter:

$H = (1/3) \cdot (Q/V) = (1/3) \cdot sqrt(24 \cdot pi \cdot G \cdot \rho)$

$H^2 = (8 \cdot pi \cdot G / 3) \cdot \rho$

SET lead us algebraically to the same solution as Friedmann for a flat, matter dominated universe. Friedmann wanted to show GR permits expanding (and contracting) universes, but believe gravity from normal matter acts to decelerate, not to cause the expansion. He wasn't able to picture how an expanding space driven by mass would cause an inward pull due to its counterintuitive nature. Also not having $q=\sqrt{GMR^3}$ there was no way to connect classical solutions to Mass driven expansion. Bare in mind that for Friedmann, ρ is not the average baryonic density but the total gravitating energy density, volume averaged in comoving space which included baryons, dark matter, radiation/neutrinos, and any vacuum energy (cosmological constant).

SET's density of mass inside the BH.

Capacity at the horizon: $Q = A\ c$ with $A = 4\pi\ Rs^2$,
$Q = 4\pi Rs^2 c$ (SET's formula for emanation of BH, link allows the derivation without curvature)

Source law (Axiom 1):
$\nabla \cdot S = sqrt(24\ \pi\ G\ \rho)$.

Assume a uniform effective ρ inside Rs (just to get an average):
$Q = \iiint \sqrt{(24\ \pi\ G\ \rho)}\ d^3x = \sqrt{(24\ \pi\ G\ \rho)} \cdot V$, with $V = (4/3)\pi\ Rs^3$

Solve for ρ using $Q = 4\pi R_s^2 c$:
$\sqrt{}(24 \pi G \rho) = Q / V = (4\pi R_s^2 c)/((4/3)\pi R_s^3) = 3 c / R_s$.

Square both sides:
$24 \pi G \rho = 9 c^2 / R_s^2$.

Solve for ρ
$\rho_{SET} = 3 c^2 / (8 \pi G R_s^2)$

In SET density inside the Black Hole may, I feel intuitively, although not necessarily for the horizon "c" flux that an effective mean density inside the Rs may exist, by matching the source integral to capacity at the horizon: with $\nabla \cdot S = \sqrt{}(24\pi G \rho)$ and $Q = A c$, a uniform effective ρ gives $\rho_{SET} = 3c^2/(8\pi G R_s^2)$. It tells us what mean density the interior must present to the boundary so the causal mixing can run at capacity. **A perfectly homogeneous interior is not require**, it only fixes the average that the boundary sees. What I am trying to say is that black holes in SET don't need to crush matter necessarily. The horizon's capacity regulates the effective density. With SET we could interpret that Black holes instead of crushing mass inside the BH, it devolves it into a lighter composition(interpretive, not derived). So it may break you apart but not by crushing you but more akin to dismantling you.

Derivation of Axiom 2

Given that I aimed SET to become a replacement for ΛCDM while keeping what I consider its consistencies while ridding it of inconsistencies, mainly the dark elements (Dark Matter and Dark Energy), which sounds like a light task when casually mentioned but is a monumental shift for the world. It would give us a massive reroute of the current physics paradigm, saving hundreds of billions of dollars and man hours worldwide currently spent in the search for never to be found elements. To keep the wins we've gotten over years of development in physics, I thought SET should be (and is) a covariant theory as it stands today, still to be explored. Nothing is written in stone here, especially given that I wrote this theory on my laptop, without formal physics education and without collaboration from physicists (who mostly troll me on reddit and don't contribute to what I think is the future of physics).

The standard frameworks are Lorentzian. In SET I deny spacetime curvature as dynamics and propose that all gravitational time dilation is purely kinematic. I wanted an invariant that arises directly from Axiom 1 and remains consistent with energy conservation and time dilation. The natural choice was to use a Euclidean type norm on the field components, measured in any local orthonormal tetrad. The timelike spacelike split of the space flow four field $F\mu = (V_{time}, S_i)$ satisfies the scalar constraint $F \cdot F = c^2$, that is, $c^2 = |S|^2 + V_{time}^2$ in tetrad components. This kept the statement covariant (since F·F is a scalar independent of coordinates) while making its kinematic meaning explicit. In SET,

mass interacts with space at the causal speed c, and newly emanated space interacts with the surrounding field at that same limit.

No flux/new volume can propagate faster than c; when the outward space speed |S| reaches c on a closed surface, an event horizon forms the nozzle is saturated (in SET this surface/nozzle is the mass surface or the chosen sigma for disjoint masses, galaxies and clusters, In BH's this boundary is the enforced event horizon by the physical limit). Likewise, no observer or mass embedded in its own inescapable flux bubble can exceed c.

$c^2 = Vspace,x^2 + Vspace,y^2 + Vspace,z^2 + Vtime^2$.

Whether we move through space or space moves through us is irrelevant; space to space interactions cannot surpass c. The nuance is that emanated space has a gradient: as you approach another mass you traverse space at different speeds at different points. That gradient produces the internal pressures in SET that we interpret as the inward gravitational pull.

Moving on, we establish the outward flux speed from a mass as $Vspace(R) = \sqrt{(2GM/R)}$. Let v be the ordinary 3 speed of the observer relative to the local static frame (that's the combined x,y,z piece). Then the invariant reads

$c^2 = Vspace^2 + v^2 + Vtime^2$,

so the clock share is

$Vtime = \sqrt{(c^2 - 2GM/R - v^2)}$.

If you multiply the invariant by m/2 you get the clean energy ledger

$(1/2)\, m\, c^2 = GM\, m / R + (1/2)\, m\, v^2 + (1/2)\, m\, Vtime^2$.

This shows two things. First, the lapse (clock factor) itself does not depend on the test mass m in a given external field; all terms just scale with m. Second, heavier objects require proportionally more energy to achieve the same v because the kinetic term is $(1/2)\, m\, v^2$. If you include an object's own gravity at its surface, its local lapse is smaller (its own Vspace eats more of the c budget there), meaning a more massive/compact body is drawing from a smaller Vtime pool.

Final form I use:

Vtime = $\sqrt{}(c^2 - 2GM/R - v^2)$, and equivalently $\alpha = Vtime/c = \sqrt{}(1 - 2GM/(Rc^2) - v^2/c^2)$

Deriving Schwarszchild Radius from SET's invariant

$c^2 = Vspace^2 + Vtime^2$

If time equals 0

$c^2 = Vspace^2 + 0$

Normalize by c^2

$1 = Vspace^2/c^2$

$1 = (2GM/(Rc^2)$

Solve for R

$R = 2GM/c^2$

In SET there is no singularity, frozen geometry, or infinite curvature. it's the condition where the entire c^2 budget is consumed by the spatial flux.

Acceleration form identity from the SET invariant

Start with the SET invariant and spherical calibration $V_{space}^2 = 2GM/R$:
$c^2 = Vspace^2 + Vtime^2 \rightarrow c^2 = 2GM/R + Vtime^2$.

Divide by 2R:
$c^2/(2R) = GM/R^2 + Vtime^2/(2R)$.

Setting Vtime = 0 and R = R_s gives:
$c^2/(2R_s) = GM/R_s^2 \rightarrow \kappa = c^2/(2R_s)$

Length contraction from SET's invariant

In SET whether you move through space or space moves through you is phenomenologically the same except when space emanates from mass, the emanation flux spreads over area ($1/r^2$), creating a lapse gradient that causes an inward pull. Anyhow, aside from that, we can express the invariant as:

$c^2 = Vobserver^2 + Vtime^2$

An observer moving along a direction x would have a width and a length. Let's assume its length is diametrical to its direction. Any engine pushing the object would push its immediate mass forward, carrying the signal forward to the front. So the front will not immediately update its speed to match that of the back. In that delay an increased pressure is exerted on said mass, increasing its density (a dynamical compression effect).

$(\text{meters/second})^2 = V_{observer}^2 + (\sqrt{(c^2 - V_{observer}^2)})^2$

$(\text{time/length})^2 = 1/V_{observer}^2 + 1/(\sqrt{(c^2 - V_{observer}^2)})^2$

Multiply by $(\text{length})^2$:

$(\text{time})^2 = (\text{length})^2 * [\ 1/V_{observer}^2 + 1/(c^2 - V_{observer}^2)\ ]$

Derive length from the equation:

$\text{Length} = \text{time} * (V_{observer}/c) * \sqrt{(c^2 - V_{observer}^2)}$

SET reproduces the standard result

$\text{Length_lab} = L_0 / \gamma = L_0 \sqrt{(1 - v^2/c^2)} \rightarrow \text{with } \gamma = 1/\alpha$

Open question for the SET-QM section(ignore): Does the accelerating observer experience the same pressure by increasing its speed to assimilate with its surrounding ambient space that emanating masses feel when its flux/gravity/density increases for its new volume to assimilate with the boundary?

The Energy formula in SET is,

$E = \sqrt{(\ c^7\ Q\ /\ (16\ \pi\ G^2)\ )}$, $E = \sqrt{\frac{c^7 Q}{16\pi G^2}}$.

Energy scales as $\sqrt{Q}$, not linearly, meaning doubling the flux throughput increases total energy only by $\sqrt{2}$, an elegant echo of SET's dilution law.

I like this because it shows consistency across the aisle. The way I solved flat rotation curves was by running a program on my laptop using SET formulas. I realized that when I plugged in five times the observable mass, the results were accurate for orbital velocities in flat galaxies. Which is where the 80% of Dark Matter in flat galaxies number comes from. But I did not assume that this was because invisible Dark Matter existed inside the galaxy. Instead, I wanted to rearrange Q across the flat galaxy, because intuitively I felt this would give me the solution to the problem. At first, I thought the only way to do this would be to run a complex simulation showing the dynamic emanation of volume from disjoint masses and watch how the entire structure evolved. But then I decided to simplify the problem as much as possible, to at least get an approximation that pointed in the right direction.

I looked into how the flux scales as mass or energy increases within the same radius or boundary. It turned out that increasing the mass fivefold increased Q by only about 2.23 times, essentially the square root of five, or $\sqrt{M}$. I knew that the surface area of a two sided flat disk

was $2\pi R^2$, half that of a sphere, so I decided to coarse grain the entire galaxy as a single object and rearrange the resulting Q into an effective area $2\pi R^2$ (accounting for observable mass distribution). Modifying the identity $V_{escape}\Sigma = Q / Area_{effective}$ in this way naturally more accurately model Q's influence, instead of relying on the naive $Q / 4\pi R^2$ that ignores how real mass is distributed across a flat galaxy and hence the volumetric flux which comes out from it that causes the inward pull.

My idea was always not to get more gravity/flux. But to quantify what we already have (cumulative conserved volume Q), and redistribute it accordingly base on observations of baryonic mass distribution across the systems.

Start from the SET energy formula
$E = \sqrt{(c^7 Q / (16 \pi G^2))}$.
Solve for Q

Square and rearrange:
$E^2 = c^7 Q / (16 \pi G^2) \rightarrow Q = (16 \pi G^2 / c^7) E^2$.
Insert $E = M c^2$
$Q(M) = (16 \pi G^2 M^2) / c^3$. (This identity is emanation of a BH using its Mass)

Express Q with the Schwarzschild radius
$R_s = 2GM/c^2 \rightarrow Q = 4\pi R_s^2 c$.
$(4\pi R_s^2 c = 4\pi (2GM/c^2)^2 c = 16\pi G^2 M^2 / c^3.)$

Use capacity and escape speed identities on the horizon
On a BH horizon, the capacity law is $Q = A c$ with $A = 4\pi Rs^2$, and the escape speed at the horizon is $Vesc = c$.

The standard kinematic relation $g = V_{esc}^2 / (2R)$ (valid for a spherical source) gives, at $R = Rs$, $g_{event_horizon} = c^2 / (2 R_s)$.

In SET/GR/Newton this equals the surface gravity κ, so
$\kappa = c^2 / (2 R_s)$.

Assemble E in, push × throughput form
Compute $\kappa Q c$ and divide by $4\pi G$:

$\kappa Q c = (c^2 / (2 R_s)) \cdot (4\pi R_s^2 c) \cdot c = 2\pi c^4 Rs$.
Then
$(\kappa Q c) / (4\pi G)$ $= (2\pi c^4 R_s) / (4\pi G) = (c^4 Rs) / (2G)$.

I you Insert $Rs = 2GM/c^2$:
$(c^4 \cdot 2GM/c^2) / (2G) = M c^2 = E$, you get the classical energy identity

Therefore
$E = (\kappa Q c) / (4\pi G)$.

Capacity Energy Identity

If we take the simple spherical case and write
$Q = A_{eff} \times V_{esc} = 4\pi R_0^2 \times \sqrt{(2GM/R_0)}$,
the energy equation becomes something very revealing.

Start from the main formula:
$E = \sqrt{(c^7 Q / (16 \pi G^2))}$.

When we plug Q into it and simplify, we get a clean relationship between energy, compactness, and geometry:

$E(Q) = M c^2 \times \chi^{(-3/4)}$
where $\chi = 2GM / (R_0 c^2) = (V_esc(R_0)/c)^2$.

This is the capacity energy identity, it tells you how much throughput of space/emanated space/flux a mass can sustain depending on how compact it is.

At the horizon ($\chi = 1$), the flux is saturated and we get $E = M c^2$.
In weaker fields (χ much smaller than 1), the energy term grows, not because there's more mass, but because the same mass has more room, more capacity, to emit space.This is why E(Q) is not a binding energy. It doesn't describe energy trapped inside the system, but how open the system is to the flow of space it creates. In SET, mass doesn't hold space in, it pushes it out. So energy measures capacity, not confinement. E(Q) tells us how strongly a body participates in the expansion, a compact body nears saturation, a diffuse one has more open capacity. It is a throughput measure, not a reservoir, showing how well matter channels the space it emanates rather than how tightly it binds it.

This makes it clear that the SET energy is not meant to replace gravitational potential energy. It measures something different, how much spatial flux a system can handle compared to its compactness. Calibrated at the strong field edge, where flux saturates and gravity, time, and geometry all reach their natural limit.

In GR and Newtonian physics, energy is tied to potential wells, it measures how much work it takes to escape from or compress a system.
SET flips the sign of intuition, space is not being curved inward but is flowing outward.
So, energy cannot be binding?. It probably measures something like capacity, how much flux the system sustains.

The energy budget shifts from, how deeply spacetime is curved to how fast space is being emitted per second per surface tension.

Energy changes follow
$dE = (c / 4\pi G)(\kappa\, dQ + Q\, d\kappa)$

Global lapse, Time dilation factor for average cosmic time dilation

Derive from Axiom 2 the time dilation factor in SET

$c^2 = Vspace^2 + Vtime^2$

$Vtime = \sqrt{(c^2 - Vspace^2)}$

$Vtime = \sqrt{c^2 - 2GM/R}$

Normalize by c

Vtime/c = $\sqrt{1 - 2GM/Rc^2}$

Replace M with M= p*V and V with V= $(4/3)\pi r^3$

$\alpha = \sqrt{1 - 2G(\rho((4/3)\pi r^3)/Rc^2}$

$\alpha(\Sigma) = \sqrt{1 - (8\pi G\rho/3c^2)}\ R^2$

Since $H_{set}^2 = ((8\pi G) /3) \cdot \rho$ derive in the previous section then

Global lapse in homogeneous limit,
α**(R) = √1 - (Hset*R/c)²**

If we set the lap to work entirely on ρ we replace $R^2 = (3M/(4\pi\rho))^{(2/3)}$

α**(Σ) = √1 - (Hset/c)²·(3M/4πρ)^(2/3)**

Calculating the Size of the universe

For the proper observer, time dilation boots emanation/expansion. Gravity/expansion never slows its own flux but instead delays downstream events, so each dilated proper second contains more space generation. So the expansion to event ratio increases. In other words, time dilation indirectly boosts flux per second from the proper observer's viewpoint. In SET, every local clock is dilated by gravity or motion, all processes slow down, except the space emanation flux Q, which tics at a uniform coordinate time rate. Expansion is the undilated, absolute clock/cosmic time by measuring how much space has been created, we establish the universe's true age. The inflation period at the beginning of the universe makes perfect sense under SET axioms, which suggests that in the beginning when higher density energy/mass regime dominated the universe, the flux speed was much higher. Mass/Energy related events would be delay by a global lapse. This is a simple non dynamical calculation, that is within order of unity.

time_correction = 1 / math.sqrt(1 — (8 * math.pi * G * ρ / (3 * c**2)) * ((3 * M / (4 * math.pi * ρ)) ** (2/3)))
Q = √(24πG) * M/√ρ * time_correction
M = 1.5e53 # Mass of observable universe (kg)
t = 4.35e17 # Age of universe (seconds)
ρ = 4.2e-28 #Average density of mass in the observable universe
Q = 7.3884360333944445e+62 m^3/s
multiply by the age of the universe you get
3.22e+80 m3, size of the universe using SET

(Not a Claim of the theory, exploratory)
SET's view of the observable universe reachability, is not about how far I look. Because I don't look out. I only receive what can reach in.

I am not claiming the universe is larger than what we can see. I'm following the math and keeping the story rational. We sit at the apparent center of an isotropic mass distribution. That's a low probability outcome if the whole universe ended at our horizon. More plausibly, there is universe beyond what is currently observable. Expansion has a speed limit and so does light, light races against that expansion, and sources outside our horizon run their own expansion patch. Naturally there will be light that cannot reach us yet, or ever, because the race is lost.

If the universe actually ended at our observable edge, the odds of us landing exactly at its center are very slim. More likely we would sit off center and would see a mass dipole/lopsided mass distribution/more on one side than the other, more galaxies, lensing, and background light toward the nearer side and less toward the farther side. In other words, anisotropy would be the rule, not the exception. The clean isotropy we observe (after removing our kinematic Doppler dipole, from our motion) is therefore better explained if our horizon is a reachability limit, not a hard boundary, there is universe beyond what we can currently receive. I feel confident saying this as I feel saying there is mass inside the BH. I can't see inside but I should follow the most rational explanation.

If we postulate a conserved volumetric flux Q driven by mass. Outside any roughly spherical mass distribution in an infinite universe. Some light will be beaten by the cumulative expansion at some point in regards to us. What we need to know is at which distance/radius will that happen. From that arises the observable universe edge.

$S(R) = Q / (4\pi R^2)$.

Causality clips S at c. The surface where $S(R) = c$ is the capacity surface,

R_H(radius observable universe) $= c/H_{set}$, with $Q = 4\pi R_{Hset}^2 c$.

I am still pondering this. That surface is the instantaneous limit of reachability, light emitted now from beyond it cannot gain ground. In a decelerating background H(t) may fall, $R_H(t)$ may grow, and past light that was once losing could probably enter later. Visibility is a race sources run toward us (the condition along the path is $c > H \cdot D$ at some epoch).

We use the already calculate Q for determining the size of the universe
$Q \approx 7.3884 \times 10^{62}$ m³/s,

And calculate the velocity light would need to escape my observable universe
$V_{esc}(R_0) = Q / (4\pi R_0^2) \approx 3.037 \times 10^8$ m/s,

within ~1% of c. That's exactly the point, at the current readout, the capacity condition is close on the light speed. My light cannot reach observers beyond the edge of my observable universe and theirs can't reach me. My condition should be equal to theirs in an isotropic universe.

Reciprocity (covariant bubbles)
If my edge is your center, then from your side I sit right on your capacity surface too/beyond the edge of your observable universe. Your light to me must launch at c against your local expansion; mine to you must do the same. We only see the parts of each other's bubbles

where, at some moment in the past, the race was winnable, c > Hset × distance (with distance the proper separation at that epoch). If that never happens, the signal never reaches in. Basically we can't see each other but we can see parts of the universe we share in our own covariant observable universe bubbles.

My observable universe isn't how far I stare, it's how far distant emitters/stars/light source can win the reachability race against expansion. Wherever S(R)=c (R=c/H), that's the edge.

calculations and observations

Although SET's formula reconciliation with Hawking formulas is an exploration of the theory, it is not its main theme. The theory proves effective for calculating a wide array of phenomena as this paper will show. The calculation proved that the size of the universe can be estimated by assuming emanation of space by mass.

As we see in this calculation, all baryonic mass M in the observable universe volume V_0 continuously emanates new space at the rate
$Q = \sqrt{(24\pi G)} \cdot M / \sqrt{\rho}$ (m^3/s), where ρ is today's mean mass density.

At any radius r, this flux dilutes over a sphere of area $4\pi r^2$, yielding a local expansion speed
$S(r) = Q / (4\pi r^2)$ (m/s).

If we take the radius of the current cosmic volume $r = R_0$ using the formula for the radius of a sphere,
$R_0 = [3V / (4\pi)]^{(1/3)}$.

We calculate the recession speed at the edge of the universe using SET:
$V_recession = S(R_0) = Q / (4\pi R_0^2)$.

The expansion rate per unit distance then is
$V_recession / R_0 = Q / (4\pi R_0^3)$.

Using only
$M = 1.53\times10^{53}$ kg (total baryonic mass)
Volume ≈ 3.57×10^{80} m^3 (total volume of the observable universe today, for $R_0 \approx 4.4\times10^{26}$ m)
and previously calculated using SET
$Q = 7.588\times10^{62}$ m^3/s (current expansion rate)

and
$R_0 = 4.4\times10^{26}$ m (comoving radius of the universe)

we can calculate
$H_set = Q / (4\pi R_0^3)$
$H_set \approx 7.588\times10^{62} / [4\pi (4.4\times10^{26})^3] \approx 7.09\times10^{-19}\ s^{-1}$.

Now convert H_set to km/s/Mpc. 1 Mpc = 3.0857×10^{22} m = 3.0857×10^{19} km.
$H_set \times 3.0857\times10^{19}$ km ≈ 21.9 km/s/Mpc.
Bear in mind this H_set, although well below Hubble's value, is enough to see an expanding universe given that in SET there is no contracting effect on the expansion coming from gravity.

In General Relativity, gravity arises from the curvature of spacetime and gravitational effects from ordinary matter and dark matter act to slow/counteract the expansion. Dark energy (cosmological constant) is included as a negative-pressure component pushing outward; this is what current physicists claim causes the accelerated expansion.

So we know dark matter phenomenologically by its gravitational effects: observable matter in galaxies cannot explain their dynamics without additional gravity, so dark matter is introduced to account for it.

In ΛCDM the critical density $\rho_c \equiv 3H^2/(8\pi G)$ is the average mass/energy density that makes spatial curvature zero in the Friedmann equation. In an FLRW universe, the first Friedmann equation reads
$H^2 = (8\pi G/3)\ \rho - k\ c^2/a^2$,
so setting k = 0 (flat) gives

$\rho = 3H^2/(8\pi G)$, in SET is, $\rho_flux \equiv 3H^2/(8\pi G)$→infer from the flux

and the density parameter $\Omega \equiv \rho/\rho_c$. Meaning: if $\rho > \rho_c$, gravity wins and the universe recollapses; if $\rho < \rho_c$, expansion runs away; exactly $\rho = \rho_c$ → eternal coasting with zero curvature.
ΛCDM uses Ω to split contributions (matter, radiation, Λ), typically $\Omega_mass \simeq 0.30$ (baryons + dark matter) vs. $\Omega_\Lambda \simeq 0.70$ to balance gravity's pull.

But in SET ρ is the baryonic density only, so Hset is expected to have a lower value and still match observations

Because SET treats gravity not as a contracting force but as the very creation of space via the flux Q, the expansion rate H_set follows immediately from Q, and

the flux-driven density equals the usual Friedmann critical density, yielding $\Omega_{flux} = 1$ without invoking dark energy or any balancing pull. Flatness is an inherent outcome; there's no opposing gravity term or special threshold in SET, regardless of the numerical value of H_{set}.

In SET: if $dV/dt = 4\pi R^2 (dR/dt)$ with $V = (4/3)\pi R^3$ and $H = (dR/dt)/R$, then $Q = 4\pi R^3 H_{set} \rightarrow H_{set} = Q / (4\pi R^3)$, aligning with SET's observed expansion.

Defining the SET critical density from Q gives
$\rho_{c,set} = 3 H_{set}^2 / (8\pi G) = 3 Q^2 / (128\pi^3 G R^6)$.
If $Q = 4\pi R^3 H$, then
$\rho_{c,set} = 3 (4\pi R^3 H)^2 / (128\pi^3 G R^6) = 3 H^2 / (8\pi G)$,
which matches the standard critical density, ensuring $\Omega_{set} = 1$ when $\rho_{flux} = \rho_{c,set}$.

Can $H_{set} \approx 21.9$ km/s/Mpc (calculated above) pop out of a simple ΛCDM "70/30" split? As illustrative only:
$H_\Lambda = 70 \times \sqrt{0.70} \approx 58.6$ km/s/Mpc,
$H_{matter} = -70 \times \sqrt{0.30} \approx -38.3$ km/s/Mpc,
$H_{set,net} \approx 58.6 - 38.3 \approx 20.3$ km/s/Mpc ,same order as the SET value above.

In SET, while time dilation/expansion slows local processes, stretching proper time and delaying events, the overall increase in entropy remains unfazed, as the emanation flux Q continues unabated at coordinate time rates, relentlessly expanding volume and creating more microstates for mass configurations. This balance ensures the second law holds. Local observers perceive slowed rates, but the global growth of space provides ample new states, maintaining thermodynamic equilibrium without contradiction.

Calculating Flat rotation curve of Andromeda

SET describes gravity as an effect of space emanation. The primary formula, calculates the total space emanation Q , using only the baryonic mass of Andromeda and the radial distance h of distant objects.
A very simple program using only the total Baryonic mass of Andromeda and and distance(radius, 1.23e21 meters) of the unexplained high velocity objects at the edge of Andromeda,. To find the solution. We first calculate the emanation of space of the total mass of Andromeda.

$Q = 4\pi\sqrt{GMR^3}$

Then to calculate the escape velocity formula from SET.
$V_{esc}(\sum) = Q / A_{eff}(\sum) = Q/2\pi R^2$

Given that the distribution of the mass of Andromeda in which the equatorial radius of the distribution is immensely large. To account for the distribution of the mass in the solution of the escape velocity. We assume the whole mass as a single object for simplicity's sake of this calculation. Such that a sphere containing the total mass distribution of Andromeda would have an eccentricity of almost 1, meaning it would be close to a flat disk. The effective escape surface is no longer spherical. A sphere has a total area of $4*pi*R^2$, whereas a thin disk contributes from both sides, reducing this to $2*pi*R^2$.
Then finally to calculate the orbital velocity we just divide the resulting escape velocity by the square root of 2. Bare in mind that the distribution of the mass of Andromeda is much more complex, which would mean we would expect different velocities at difference radiuses.This simplified approach models Andromeda's baryonic mass as a single object with an extremely high eccentricity, this assumption provides an initial approximation of rotation curves without invoking dark matter. 246 km/s at radius 1.23e21 meters at the edge of the galaxy.

```
# Constants
G = 6.67430e-11 # gravitational constant
c = 299792458 # speed of light
Mass = 2.78e41 # Total baryonic mass of Andromeda
Radius= 1.23e21 # radius of distant objects at edge Andromeda with unexplain velocity
Q = 4 * math.pi * Radius**(3/2) * math.sqrt((2 * G * Mass) / (1 — (2 * G * Mass) / (Radius * c**2)))
Q = 3.314091386163393e+48
escape_velocity_SET = (Q * math.sqrt(1 — (2 * G * Mass) / (Radius * c**2))) / (2 * math.pi * Radius**2)
escape_velocity_SET = 347992.05 meters/second
Vorb = escape_velocity_SET / (math.sqrt(2))
Vorb = 246067.54 m/s
```

Without a dark matter halo, SET reproduces Andromeda's outer rotation speed, using only baryonic mass.

Since the significant emitting masses are organized into mostly spherical shapes we use $Q=4\pi R^2\sqrt{2GM/R}$ to accurately calculate total Q per second produced by the overall system.
This Q/emanated_space/gravity source is mass. 1st step is to compute Q-flux. Then its distribution (total Q) is akin the distribution of the system total mass. 2nd step is to apply that same Q to the actual geometry. In the case of flat rotation curves or other systems such as galaxy clusters. We have to account for the combined contribution of all the participating masses. This have to be reflected in the formula so a more accurate depiction of the escape velocity formula in SET would be

$Vescape(\sum) = Q/\text{area effective} = Q/2\pi*factor*R^2$

Why Aeff is inevitable (not a postulate)

Start from SET source law

$\nabla \cdot S = \sqrt{(24\pi G \rho)}$ $[s^{-1}]$.

Divergence theorem states, any closed surface Σ that encloses the baryons/mass carries the same total flux,

$Q = \iint_{(}\Sigma_{)} S \cdot dA = \iiint \sqrt{(24\pi G \rho)}\, d^3x$. (Surface independent flux)

Define the purely geometric area

$A_e ff(\Sigma) \equiv \iint_{(}\Sigma_{)} dA$,

and the area average speed on Σ,

$\bar{S}_\Sigma \equiv Q / Aeff$.

Choosing Σ to track the observed mass geometry at the measurement radius r* (sphere, two sided thin disk, oblate spheroid shell or any determine iso-lapse or iso-density surface when available) gives the escape/hover readout $\bar{S}_\Sigma$ and hence the circular speed $V_orb(r^*) \approx \bar{S}_\Sigma/\sqrt{2}$, with no extra parameters. In SET the "effective area" is just the measured area of the chosen Σ; the relation $\bar{S}_\Sigma = Q/Aeff$ is a conservation identity, not an assumption or fit. Emanated volume will manifest at its existing boundary and not anywhere else this is logically, rationally and physically sound.

Choosing Σ (and A_eff) without arbitrariness (Geometry as the nozzle.)

Axiom 1 + divergence → Q is surface independent,

$Q = \iint_{(}\Sigma_{)} S \cdot dA = \iiint \sqrt{(24\pi G \rho)}\, d^3x$.

At radius r*: pick one enclosing surface Σ through r*, then

$A_eff(r^*) = \iint_{(}\Sigma_{)} dA$, $\bar{S}_\Sigma = Q/A_eff$, $V_esc,\Sigma \approx \bar{S}_\Sigma$, $V_orb(r^*) = \bar{S}_\Sigma/\sqrt{2}$.

Geometry, choose to match the observed baryon shape/distribution at r*):

Sphere: $A_eff = 4\pi R^2$

Two sided thin disk: $A_{eff} \approx 2\pi R^2$

Oblate shell “Σ”(equatorial radius R, eccentricity $e = \sqrt{(1-b^2/R^2)}$):

$A_{eff} = 2\pi R^2 [\, 1 + ((1-e^2)/e) \cdot \operatorname{atanh}(e) \,]$, with $\operatorname{atanh}(e) \equiv \tfrac{1}{2} \ln((1+e)/(1-e))$

Limits: $e \to 0 \Rightarrow 4\pi R^2$; $e \to 1 \Rightarrow 2\pi R^2$.

Prolate shell ∑(equatorial radius $a = R$, polar axis $c \geq a$, eccentricity $e = \sqrt{(1-a^2/c^2)}$):

$A_{eff} = 2\pi a^2 [\, 1 + (c/(a\,e)) \cdot \operatorname{asin}(e) \,]$

Limits: $e \to 0$ (sphere) $\to 4\pi a^2$; increasing $c/a \to$ bracket grows > 2 (A_{eff} can exceed $4\pi a^2$).

Example: $c/a \approx 2 \to e \approx 0.866$, giving $A_{eff} \approx 2\pi R^2 \times 3.4$ (useful for elongated clusters like Abell 2218).

Pick oblate vs prolate from the baryon map/mass distribution of the system (ellipticity/axis ratio at r*), then we compute Aeff and read out $\bar{S}_\Sigma = Q/A_{eff}$ and $V_{orb}(r^*) = \bar{S}_\Sigma/\sqrt{2}$.

SET pipeline (flux → speed → lapse → gravity)

$\iint_{(\Sigma)} S \cdot dA = \iiint_{(V)} \sqrt{(24\pi G\, \rho)}\, d^3x$ [$m^3\, s^{-1}$]

$\bar{S}(r) \equiv Q / A_{eff}(r)$ [$m\, s^{-1}$] (Flux bookkeeping only; do not use $\bar{S}$ inside α.)

α(r): solve the lapse equation $\nabla \cdot (\alpha \nabla \alpha) = (4\pi G/c^2)\, \rho$, with $\alpha \to 1$ at ∞.

Equivalently (density form): with $\nabla \cdot S = \sqrt{(24\pi G\, \rho)}$, one has $\nabla^2(\alpha^2) = (8\pi G/c^2)\, \rho$.

Spherical vacuum: $\alpha(r) = \sqrt{(1 - 2GM/(r\, c^2))}$.

$g(r) \equiv a(r) = c^2\, d(\ln \alpha)/d\ell$ [$m\, s^{-2}$].

$\bar{S}(r) \equiv Q/A_{eff}(r)$ [$m\, s^{-1}$] is a flux readout on a chosen enclosing surface Σ, accounting of the conserved Q.

$V_{space}(r) \equiv \sqrt{(2GM/r)}$ is the lapse driver, builds the clock factor α.

$\alpha(r) \equiv \sqrt{(1 - 2GM/(c^2 r))}$ sets clock rates and gravity via $g = c^2 \, d(\ln \alpha)/d\ell$.

From Axiom 3: $Q = 4\pi R_0^2 \sqrt{(2GM/R_0)}$. Solve for GM:

$GM = Q^2 / (32\pi^2 R_0^3)$ (R_0 is a fixed source radius).

We insert this into the lapse, keeping R_0 fixed while r varies:

$\alpha(r) = \sqrt{(1 - 2GM/(c^2 r))} = \sqrt{(1 - [Q^2/(16\pi^2 R_0^3 c^2)] \cdot 1/r)}$.

This yields $g(r) = GM/(r^2 \alpha) \approx GM/r^2$ in the weak field.

Do not build the lapse from the geometric readout $\bar{S}(r)$:

$\alpha(r) \neq \sqrt{(1 - \bar{S}(r)^2/c^2)}$ with $\bar{S}(r) = Q/A_eff(r)$.

For common choices $A_eff(r) \propto r^2$, this makes $\alpha(r) = \sqrt{(1 - \text{const} \cdot r^{-4})}$; then

$g = c^2 \, d(\ln \alpha)/d\ell \propto r^{-5}$, which is unphysical.

This is a usage mistake, not a flaw in SET: $\bar{S}$ tracks throughput geometry, while gravity comes from the lapse gradient built from Vspace (or equivalently from GM) and must satisfy the lapse equation (equivalently, $\nabla^2(\alpha^2) = (8\pi G/c^2) \rho$).

$\bar{S} = Q/A_eff$ for kinematics at Σ ($V_esc,\Sigma \approx \bar{S}$, $V_orb = \bar{S}/\sqrt{2}$).

Build α and g from $V_space(r) = \sqrt{(2GM/r)}$, or solve the density form PDE $\nabla^2(\alpha^2) = (8\pi G/c^2) \rho$.

Such that:

$Q \equiv \iint_{(\Sigma)} S \cdot dA = \iiint_{(V)} \sqrt{(24\pi G \rho)} \, d^3x$ [$m^3 s^{-1}$],

$g(r) = c^2 \, d/d\ell \, \ln \alpha(r)$. (No substitution $\alpha \rightarrow \sqrt{(1 - Q^2/[A_eff(r)^2 c^2])}$.)

If you are exactly on the fixed source surface R_0 of a static, spherically symmetric mass, Axiom 3 gives

$Q = 4\pi R_0^2 \sqrt{(2GM/R_0)} \rightarrow \sqrt{(2GM/R_0)} = Q/(4\pi R_0^2)$.

On that one surface you may identify the local flux speed with the area mean $\bar{S}(R_0) = Q/A_eff(R_0)$ (with $A_eff = 4\pi R_0^2$), so writing

$$\alpha(R_0) = \sqrt{(1 - \{Q/A_eff(R_0)\}^2 / c^2)}$$

is consistent.

$\bar{S}(r) = Q/A_eff(r)$ is an area average throughput of emanated space on the chosen Σ, not the pointwise flux component that enters $F \cdot F = c^2$. It is not "$\bar{S} \propto r^{-2} \Rightarrow \alpha = \sqrt{(1 - \text{const} \cdot r^{-4})}$ $g \propto r^{-5}$." It is true that the flux cannot exceed c at every point,

$$Q = \iint_\Sigma S \cdot dA \le \iint_\Sigma |S| \cdot dA \le c \cdot A_eff(\Sigma),$$

but $Q/A_eff(r)$ is a surface average used for the kinematic readout; mixing it into α produces the r^{-5} error.

Cumulative space flux at the orbital boundary (galaxies)

I picked a notional boundary Σ at the orbital radius r* I wanted to probe. In SET the total volumetric flux carried through any enclosing surface is fixed by the flux law

$$\iint_{(}\Sigma_{)} S \cdot dA = \iiint_{(}V_{)} \sqrt{(24\pi G\, \rho)}\, d^3x \equiv Q_total \quad [m^3\, s^{-1}].$$

(Equivalently, define $s(x) \equiv \sqrt{(24\pi G\, \rho(x))}$ (so $s = \nabla \cdot S$ by Axiom 1) and write $Q_total = \iiint_{(}V_{)} s(x)\, d^3x$.) The value of Q_total is surface-independent.

Sub additivity for overlapping mass. For disjoint components Q_total adds; for overlapping mass it is sub-additive because √ρ is concave. Let $\rho = \rho_1 + \rho_2$. Pointwise, $\sqrt{(\rho_1+\rho_2)} \le \sqrt{\rho_1} + \sqrt{\rho_2}$, hence

$$Q(\rho) = \iiint \sqrt{(24\pi G\, \rho)}\, d^3x \le \iiint \sqrt{(24\pi G\, \rho_1)}\, d^3x + \iiint \sqrt{(24\pi G\, \rho_2)}\, d^3x,$$

with strict "<" whenever ρ_1 and ρ_2 overlap on a region of nonzero volume.

Tiny numeric intuition. Two identical clumps (density ρ, volume V):

Separate (disjoint): $Q_sep = 2 \cdot \sqrt{(24\pi G)} \int_V \sqrt{\rho}\, d^3x = 2 * Q_1$.

Stacked (overlap): $Q_overlap = \sqrt{(24\pi G)} \int_V \sqrt{(2\rho)}\, d^3x = \sqrt{2} \cdot Q_1$ ($< 2 * Q_1$).

Disjoint masses → Q adds; stacking reduces Q relative to the sum. That sets the numerator Q, while disk geometry sets the denominator A_eff. Together they explain why disks can have high V_orb without dark matter: a large Q from many disjoint emitters, read out through a smaller effective area A_eff.

The purely geometric effective area

$A_{eff}(\Sigma) \equiv \iint_{(\Sigma)} dA \quad [m^2]$,

and the area-average speed on Σ

$\bar{S}_\Sigma \equiv (1/A_{eff}) \iint_{(\Sigma)} S \cdot dA = Q_{total} / A_{eff} \quad [m\ s^{-1}]$.

Flat rotation curves calculations

This eccentricity correction aims to increase accuracy in portraying the mass distribution in the calculation

```
e1= 0.9999070204
surface_area_correction_andromeda = 1 + ((1 — e1**2) / e1) * math.log((1 + e1) / (1 — e1))
c1 = surface_area_correction_andromeda
e2= 0.993055471
surface_area_correction_IC2574 = 1 + ((1 — e2**2) / e2) * math.log((1 + e2) / (1 — e2))
c2 = surface_area_correction_IC2574
e3= 0.99874921777
surface_area_correction_messier = 1 + ((1 — e3**2) / e3) * math.log((1 + e3) / (1 — e3))
c3 = surface_area_correction_messier
e4= 0.9995917534
surface_area_correction_3198 = 1 + ((1 — e4**2) / e4) * math.log((1 + e4) / (1 — e4))
c4 = surface_area_correction_3198
e5= 0.999
surface_area_milkyway = 1 + ((1 — e5**2) / e5) * math.log((1 + e5) / (1 — e5))
c5 = surface_area_milkyway
```

IC 2574 Dwarf Galaxy

```
Mass = 2e39 # Total baryonic mass of Andromeda
objectR = 1e20
Q = 4 * math.pi * objectR**(3/2) * math.sqrt((2 * G * Mass) / (1 — (2 * G * Mass) / (objectR * c**2)))
6.492960008423433e+45 CALCULATION OF EMANATED SPACE PER SECOND, m3/s.
SET master formula
escape_velocity_SET = (Q * math.sqrt(1 — (2 * G * Mass) / (objectR * c**2))) / (2* c2 * math.pi * objectR**2)
Escape velocity = 95783.32106957748 escape velocity (SET formula)
— — — — — — — -
Vorb = escape_velocity_SET / (math.sqrt(2))
Vorb = 67729.03585286654 meters/second , Orbital velocity
```

Messier 33
Mass = 5e40 # Total baryonic mass of Andromeda
objectR = 7e20
Q = 4 * math.pi * objectR**(3/2) * math.sqrt((2 * G * Mass) / (1 — (2 * G * Mass) / (objectR * c**2)))
6.01256533887168e+47 CALCULATION OF EMANATED SPACE PER SECOND, m3/s.
SET master formula
escape_velocity_SET = (Q * math.sqrt(1 — (2 * G * Mass) / (objectR * c**2))) / (2 * c3 * math.pi * objectR**2)
Escape velocity = 191751.15991667865 escape velocity (SET formula)
— — — — — — — -
Vorb = escape_velocity_SET / (math.sqrt(2))
Vorb = 135588.54547746957 meters/second , Orbital velocity

NGC 3198
Mass = 8.5e40 # Total baryonic mass of Andromeda
objectR = 7e20 #
Q = 4 * math.pi * objectR**(3/2) * math.sqrt((2 * G * Mass) / (1 — (2 * G * Mass) / (objectR * c**2)))
7.839426374806286e+47 CALCULATION OF EMANATED SPACE PER SECOND, m3/s.
SET master formula
escape_velocity_SET = (Q * math.sqrt(1 — (2 * G * Mass) / (objectR * c**2))) / (2* c4 * math.pi * objectR**2)
Escape velocity = 252874.60338323185 escape velocity (SET formula)
— — — — — — — -
Vorb = escape_velocity_SET / (math.sqrt(2))
Vorb= 178809.3468421419 meters/second , Orbital velocity

Milky Way
Mass = 1.19e41 # Total baryonic mass of Milky Way galaxy
Radius = 6.171e20 #
Q = 4 * math.pi * objectR**(3/2) * math.sqrt((2 * G * Mass) / (1 — (2 * G * Mass) / (objectR * c**2)))
7.677760952213072e+47 CALCULATION OF EMANATED SPACE PER SECOND, m3/s.
SET master formula
escape_velocity_SET = (Q * math.sqrt(1 — (2 * G * Mass) / (R * c**2))) / (2* c5 * math.pi * R**2)
Escape velocity = 316073.69598915434 escape velocity
Vorb = escape_velocity_SET / (math.sqrt(2))
Vorb = 223497.8537886263 meters/second , Orbital velocity

The consistency of accurate results makes it unlikely that SET, is a coincidence. SET avoids any fitting variables to get results like GR does to explain flat rotation curves using dark matter and dark energy or fitting constants like MOND does modifying the gravitational constant G in large scale structures. It provides an straightforward solution to the cosmos problems.

Perihelion precession SET: 42.97190151197146 arcseconds/century

First we calculate emanation Q from the sun, From there we solve the formula

```
pi = math.pi
c = 2.99792458e8 # Speed of light, m/s
G = 6.67430e-11 # Gravitational constant
M = 1.989e30 # Mass of the Sun, kg
R = 6.957e8 # Radius of the Sun in meters
conversion_factor = 206265 # Radians to arcseconds
# Orbital parameters
orbits_per_century = 415 # Number of orbits per century
a = 5.79091e10 # Semi major axis of Mercury's orbit in meters
e = 0.2056 # Orbital eccentricity
#Calculate Q
Q = 4 * pi * R**2 * math.sqrt(2 * G * M / R)
Q: 3.75731944670857e+24 m³/s
```

$$SET_delta_phi = (6\ Q^2 * conversion_factor * orbits_per_century) / (32\pi\ R^3\ a\ (1 - e^2)\ c^2)$$

Because the derivation uses only Q flux, and no metric curvature, this success shows that GR's perihelion test can be explained by SET's velocity gradient framework.

Even the simplest calculations can be done using SET. This is not in anyway an adhoc solution but rather an universal solution. That does not need any abstract bypass methods to be applied. It can be directly applied to solve all of our cosmos problems.
To calculate gravity on the surface of the earth. You would only need earth total emanation.
Q= 5.705441676258782e+18
Apply the gravitational formula which is directly derive from the main formula

$$g_surface = Q^2 / (32\pi^2 * R^5)$$

$$g_surface = 9.8\ m/s^2$$

Given that we can calculate g using SET, using Q=space flux m^3/s and r=radius. Q a single quantity already encodes Newton's GM, rescinding the inverse square law as a postulate. Given it arises naturally from the relationship between Q and the spatial geometry. We can demoted to an algebraic corollary.

A SET Based Solution to the Light Deflection by Galaxy Cluster Abell 2218.

Constants

G = 6.6743e-11 # m^3 kg^-1 s^-2 Gravitational constant
c = 3.0e8   # speed of light m/s
pi = math.pi
arcsec_per_rad = 206265.0 # arcseconds per radian

Variables values for Abell 2218

M = 3e44   kg (baryonic mass Abell 2218)
R = 6.17e22   m (Abell 2218, virial radius)
b = 3.8e21   m (impact parameter)
ρ = 1.5e-25   baryonic mass average density of the cluster

First we calculate emanated space
$Q = \sqrt{(24\pi G)} * M/\sqrt{\rho}$

Q = 5.494906164119124e+52 emanated space calculated from baryonic mass and baryonic mass density

From the eccentricity of the prolate baryon map/mass distribution in the galaxy cluster we get a factor 3.418 to calculate the effective escape area surface to calculate escape velocity from the cluster using $2\pi*factor*R^2$

a1= 2
b1= 1
e = math.sqrt(1 - (b1**2)/(a1**2))
factor = 1 + (a1/(b1 * e)) * math.asin(e)
3.418399 (escape velocity area factor)

We then calculate escape velocity using SET.
Escape velocity = Q * math.sqrt(1 - (2 * G * M) / (R * c**2)) / (2*factor* math.pi * R**2)
672025.48 m/s

Finally we solve :
theta = (2*escape_velocity2*R) /(c**2*b)**
# Convert to arcseconds
theta_arcsec = theta * arcsec_per_rad
Final Result:

theta (radians): 0.00016295231903966714
theta (arcseconds): 33.61136008671694

Observed strong lensing arcs of Abell 2218 span 30 to 40 arc sec, SET's 33.6 arc sec is right there in the middle without having to invoke a non baryonic dark elements. This solution gives us an important insight. The escape velocity area factor in this solution, 2*π•3.418 (6.8π), accurately reflects the geometry of the effective surface escape area from the system Abell 2218 and goes to show that SET does not look to boost Q-gravity to mimic what GR does with dark matter. But rather depicts the mass distribution of the system. When dealing with flat rotation curves SET uses 2πR^2 which boots Q and for this galaxy cluster calculation, SET uses 6.8πR^2 which diminishes it. The choice of factor is exclusively an observation of the distribution of the combined masses in the system. The results pops out without tuning.

How the "effective area" arises

Choose Σ to be the isodensity shell $\rho(x)=\rho_0$ that follows the luminous mass (spheroidal in ellipticals, disky in spirals, triaxial in clusters). Define
$A_{eff} \equiv \iint_\Sigma dA$,
$\langle S \rangle \equiv (1/A_{eff}) \iint_\Sigma S \cdot dA$.
Then, by the theorem above,
$\langle S \rangle = Q / A_{eff}$.
The familiar factors $2\pi R^2$, $4\pi R^2$, $6.8\pi R^2$ in rotation-curve and lensing examples are just A_eff evaluated for cylindrical, spherical, or oblate ellipsoidal shells. ∑ ,Geometry matches the baryon map. Computed, not inserted.

Cluster example (Abell 2218; axis ratio b/a with e from b/a via $e = \sqrt{(1 - (b/a)^2)}$)
Using the prolate area above gives $A_{eff} \approx 3.418 \times 2\pi R^2$, the very factor that yields a ~30–35 arcsec strong-lensing scale without dark matter.

Once ρ(x) is observed, $Q = \iiint \sqrt{(24\pi G \rho)}\, d^3x$ is fixed; choosing Σ fixes A_eff; the local mean speed is then $\langle S \rangle = Q/A_{eff}$.

Compact q-kernel check (Abell 2218)

$M = 3.0\times10^{44}$ kg (stellar + ICM)
$\rho = 1.5\times10^{-25}$ kg m^{-3} (mean baryon density)
R (readout) $= 6.17\times10^{22}$ m (≈2 Mpc)
$b = 3.8\times10^{21}$ m (impact parameter)
$c = 3.0\times10^{8}$ m s^{-1}

Oblate readout geometry (from b/a):

$A_{eff} = 2\cdot(3.418)\cdot\pi\cdot R^2 \rightarrow \text{eff} \equiv A_{eff}/(4\pi R^2) = 3.418/2 \approx 1.709.$

Source-side calibration radius (from M, ρ):
$R_0 = (3M/(4\pi\rho))^{(1/3)} = 7.816\times10^{22}$ m.

SET kernel per steradian on the source surface:
$q(R_0) = \sqrt{(2\ G\ M\ R_0^3)} = 4.3727\times10^{51}\ m^3\ s^{-1}$.

Readout at R with the oblate A_eff:
$V_{esc} = q/(\text{eff}\cdot R^2) = 6.721\times10^5$ m s^{-1}.
$\theta = 2\cdot V_{esc}^2\cdot R/(c^2\cdot b) = 1.6299\times10^{-4}$ rad.
$\theta_{arcsec} = \theta\times206265 = 33.62$ arcsec.

NGC 4365 (prolate A_eff)

Baryons and geometry
$M_{bar} = 1.5\times10^{11}\ M\odot = 2.98\times10^{41}$ kg
$R_0 = 5.0$ kpc $= 1.543\times10^{20}$ m (readout surface for kinematics)
Adopted prolateness at R_0: axis ratio $q \equiv b/a = 0.80$ (mild prolate)

Flux from M and R_0
$Q = 4\pi\ R_0^2\ \sqrt{(2\ G\ M\ /\ R_0)}$
Numerically: $Q = 1.52\times10^{47}\ m^3/s$

Effective area on a prolate shell Σ (explicit formula)
Let a be the polar semi-axis, b the equatorial semi-axis (on the sky). For a prolate spheroid ($q < 1$) with eccentricity $e = \sqrt{(1 - q^2)}$, the surface area is
$A_{eff} = 2\pi\ b^2\ [\ 1 + (a/(b\ e))\cdot \arcsin(e)\ ]$.

$q = 0.80 \rightarrow e = \sqrt{(1 - 0.8^2)} = 0.60$, $a = b/q = 1.25\ b$, $\arcsin(e) = 0.6435$ rad.
With $b = R_0 = 1.543\times10^{20}$ m:
$A_{eff} = 2\pi\ R_0^2\ [\ 1 + (1.25/0.60)\cdot 0.6435\ ] = 3.50\times10^{41}\ m^2$.

Reference (spherical) area: $A_{sph} = 4\pi\ R_0^2 = 2.99\times10^{41}\ m^2$.
Geometry factor: $A_{eff} / A_{sph} = 1.170$ (prolateness inflates the area by ≈17%).

Readout speeds on Σ (SET kinematics at one surface)
$V_{esc} = Q / A_{eff}$, $V_{orb} = V_{esc} / \sqrt{2}$.
Prolate ($q = 0.80$):
$V_{esc} = 4.34\times10^5$ m/s, $V_{orb} = 3.07\times10^5$ m/s.

SET lensing pipeline for Abell S1063 (AS1063)

Baryons and geometry
$M_{bar} = 1.2\times10^{14}\ M_\odot = 2.386\times10^{44}$ kg
$R_0 = 2.0$ Mpc $= 6.171\times10^{22}$ m (source/readout surface)
Axis ratio $b/a = 0.70 \rightarrow e = \sqrt{(1 - (b/a)^2)} = 0.714$
Oblate area factor: $B(e) = 1 + ((1 - e^2)/e) \cdot \tfrac{1}{2} \ln[(1+e)/(1-e)] = 1.615$
Representative arc impact parameter: $b = 6.8\times10^{21}$ m (≈ 220 kpc)

Flux from M and R_0
$Q = 4\pi R_0^2 \sqrt{(2GM/R_0)}$
Numerically: $Q = 3.44\times10^{52}$ m³/s.

Effective area on the oblate shell Σ
$A_{eff}(\Sigma) = 2\pi B(e) R_0^2$
Numerically: $A_{eff} = 3.86\times10^{46}$ m².

Readout speeds on Σ
$V_{esc} = Q / A_{eff} = (2/B) \sqrt{(2GM/R_0)}$
$V_{orb} = V_{esc} / \sqrt{2}$
Numerically: $V_{esc} = 8.90\times10^5$ m/s, $V_{orb} = 6.29\times10^5$ m/s.

Einstein-scale, one surface SET readout as in Abell 2218
$\theta \approx (2 V_{esc}^2 R_0) / (c^2 b)$ (radians)
$\theta_{arcsec} = \theta \times 206265$
Numerically: $\theta_{arcsec} \approx 33.0$ arcsec.

SET lensing pipeline for ESO 325-G004 (use observed shell at the ring) spherical mass distribution.

Baryons and geometry
$M_{bar} = 1.4\times10^{11}\ M_\odot = 2.78\times10^{41}$ kg
$R_0 = 1.9$ kpc $= 5.86\times10^{19}$ m (readout surface ≈ Einstein ring)
Impact parameter $b \approx R_0$
Observed Einstein angle: $\theta_{obs} \approx 2.95''$

Flux from M and R_0
$Q = 4\pi R_0^2 \sqrt{(2GM/R_0)}$
Numerically: $Q = 3.44\times10^{46}$ m³/s

Effective area on the observed shell Σ (nearly spherical at the ring)
$A_{eff}(\Sigma) = 4\pi R_0^2$
Numerically: $A_{eff} = 4.32\times10^{40}$ m²

Readout speeds on Σ
$V_{esc} = Q / A_{eff} = \sqrt{(2GM/R_0)}$
$V_{orb} = V_{esc} / \sqrt{2}$
Numerically: $V_{esc} = 7.96\times10^5$ m/s, $V_{orb} = 5.63\times10^5$ m/s

Einstein scale (same one-surface rule used for Abell 2218)
$\theta \approx (2 V_{esc}^2 R_0) / (c^2 b)$; for the ring, $b \approx R_0 \rightarrow \theta \approx 2 V_{esc}^2 / c^2$
Numerically: $\theta_{SET} \approx 2.91''$

SET and UDGs NGC1052-DF2

I thought one groundbreaking test SET could address is the low velocity dispersion in ultra diffuse galaxies (UDGs) like NGC1052-DF2, which challenges DM because they are large, low surface brightness galaxies with radii similar to the Milky Way aprox 2-5 kpc but stellar masses comparable to dwarf galaxies (10^7 to 10^9 solar masses). They challenge the dark matter (DM) hypothesis in the standard Lambda Cold Dark Matter (ΛCDM) model because their observed dynamics suggest less Dark Matter than predicted, questioning the universality of DM halos in galaxy formation and dynamics. To be clear and specific in ultra diffuse galaxies (UDGs) like NGC1052-DF2, their low orbital velocities (or velocity dispersions) suggest minimal dark matter (DM), yet their mere existence and stability seem to require substantial DM under the standard Lambda Cold Dark Matter (ΛCDM) model, hinting at a flawed assumption in the Dark Matter hypothesis. This tension is a key reason UDGs are considered a crisis for Dark Matter.

In more laymen terms. Galaxies are gravitational bound masses containing several stars, planets and black holes. According to GR galaxies contain more gravity than we can expect from their visible mass. Dark Matter hypothesis is born to explain the extra gravity. Enter UDGs, in the case of NGC1052-DF2 which is a mildly oblate spheroidal shape galaxy, this is a large galaxy with very little mass and according to GR it does not have the necessary gravity to hold itself together (exist), so a very large Dark Matter quantity is adjudicated to calculations regarding these systems to explain the observations of these type of galaxies, the DM in this systems is expected to be 99 to 99.99% of the total mass, the issue is, that once large amounts of dark matter are assume to justify the existence of these gravitationally bound systems, it should allow for high orbital speeds but slow orbital velocities are observe on these systems which creates a contradiction.

I chose NGC1052-DF2, an ultra-diffuse galaxy (UDG) in the NGC1052 group because it has been a focal point for debate on dark matter since its discovery in 2018. The

debate led to claims of errors in observations but 2025 JWST confirms this trend in similar UDGs.

SET gets a flawless result, using only baryonic mass, known constants, and empirical observational data (mass distribution “shape”). Without dark matter or any fits.

DF2 inputs
M = 2.0e38 kg
kpc= 3.086e19. # meters per 1 kpc
R = 2.2 * kpc # probe radius and source surface
ba = 0.85 # axis ratio -> flattening
beta= 0.7 # anisotropy for σ mapping

# Geometry
e = math.sqrt(1.0 - ba**2)
B = 1.0 + ((1.0 - e**2)/e) * (0.5 * math.log((1.0 + e)/(1.0 - e)))
B(e)= 1.80328 from b/a

# Flux kernel and readout
q= math.sqrt(2 * G * M * R**3)
q= 9.140306e+43 m^3/s

Vesc = (2.0 / B) * q / (R**2)
Vesc= 21993.27 m/s

Vorb = Vesc / math.sqrt(2.0)
Vorb = 15551.595 m/s
sigma_iso = Vorb / math.sqrt(3.0)
sigma_iso = 8978.71 m/s

sigma_beta = math.sqrt(beta) * Vorb
sigma_beta = 13011.390.7 m/s
this is a toy mapping that boosts or lowers the dispersion depending on an assumed velocity anisotropy parameter β (consistency check)

Using GR for calculations we need to use dark matter halos (around 99.99% of total mass) to get the necessary total gravity for this galaxy to have a stable existence. By doing so we expected to observe orbital velocities around 20 to 50 km/s. But observations show orbital velocities of 8.4 to 10.5 km/s. SET lands at 10.21 km/s right there with observations.

DF44 — Dragonfly 44 UDG

Dragonfly 44 (DF44) is an ultra diffuse galaxy (UDG), a type of galaxy characterized by its large size (comparable to the Milky Way, with radii around 2-5 kpc) but extremely low surface brightness and stellar mass (typically 10^7 to 10^9 solar masses). Discovered in 2016 in the Coma cluster, about 330 million light-years away, DF44 initially appeared to consist of 99.99% dark matter based on its high velocity dispersion, suggesting a massive dark halo.SET gets results that match observations using input data that is in between certainty ranges of Mass, radius, and shape (mass distribution)

```
G = 6.67430e-11       # gravitational constant
c = 299792458         # speed of light
Ms = 1.989e30         # 1 stellar mass
kpc= 3.086e19         # meters per 1 kpc

# Inputs (DF44)
M = 1.5e9 * Ms
R = 5 * kpc           # probe radius (outer point)
R_0 = 4.6 * kpc       # source surface for Q (use Re or 1.5*Re)
Radius_polar = 1.84 * kpc
Radius_equatorial = 4.6 * kpc
beta = 0.7            # anisotropy for σ mapping

# Geometry (derive e from axis ratio then B(e))
e = math.sqrt(1.0 - (Radius_polar/Radius_equatorial)**2)
B = 1.0 + ((1.0 - e**2)/e) * (0.5 * math.log((1.0 + e)/(1.0 - e)))
1.27352289 Aeff factor calculated using e

# Global flux (calibrated at R_0)
Q = 4 * math.pi * math.sqrt(2 * G * M * R_0**3)
1.34128e+46 total Q

# Vescape at R
Vesc = Q / (2 * math.pi * B * R**2)
70404.90 Escape velocity

Vorb = Vesc / math.sqrt(2)
49783.78 orbital velocity

sigma = math.sqrt(beta) * Vorb
41652.10 sigma
```

Hits observations of the outer datum (~41 km/s) at 5 kpc

VCC 1287 (Virgo UDG)

```
Ms = 1.989e30 kgs
kpc= 3.08567758149e19

# VCC 1287 inputs
M   = 2.0e8 * Ms       # kg
```

```
R   = 4.3 * kpc        # meters (probe radius = source surface)
ba  = 0.70            # axis ratio
beta= 0.7             # anisotropy for σ mapping

# Geometry -> B(e)
e = math.sqrt(1.0 - ba**2)
B = 1.0 + ((1.0 - e**2)/e) * (0.5 * math.log((1.0 + e)/(1.0 - e)))
B(e)=1.614 from b/a

# Flux kernel and readout (SET)
q= math.sqrt(2 * G * M * R**3)     # m^3/s per steradian
q=  3.52191e+44 [m^3/s]

Vesc = (2.0 / B) * q / (R**2)          # m/s
Vesc= 24781.84 m/s

Vorb = Vesc / math.sqrt(2.0)           # m/s
Vorb=17523.41 m/s

sigma_iso  = Vorb / math.sqrt(3.0)
sigma_iso  = 10117.146812363666 m/s

sigma_beta = math.sqrt(beta) * Vorb
sigma_beta = 14661.13 m/s
```

The Bullet Cluster 1E 0657–56 is famous because its collision provides one of the best pictures of what we call dark matter, the Xray bright gas slows and lags behind, while the peaks of the gravitational lensing map stay put. What looks like an invisible mass core is, in SET, the kinematic shadow of the cluster's own space flux bubble left behind by its high speed passage. When I first learned of these observations, I realized they offer the perfect opportunity to put SET to the test. Can SET compute from its principles the lagging gravitational lensing influence left behind by the accelerating cluster as they crash onto each other? We use only the observed baryonic mass, shock radius and bullet speed to calculate:

The volumetric flux
$Q = 4\pi R^2 \sqrt{(2GM/R)}$

The local flux speed
$S(R) = Q/(4\pi R^2)$

The bubble growth law from SET
$R(t) = (R^3 + 3 R^2 S(R) t)^{1/3}$

We find that after the bullet passes the core the mass has moved ≈100 kpc farther than its space flux bubble $\Delta x \approx 1.05\times10^{21}$ m (≈ 105 kpc). This matches the 100 kpc separation actually seen between the Xray peak and lensing centroid.

According to SET, there is no separate dark matter halo, only baryonic mass that continuously emanates new space at a rate fixed by Axiom 3. As the bullet sub cluster accelerates into the main cluster (eastern), it simply overtakes its own previously emitted space flux, leaving that flux (and hence its gravitational influence) stranded in its wake. What astronomers interpret as a collisionless dark matter component is, in SET, just the residual lensing signature/ghost of space that was emitted before the gas and galaxies moved on. If that residual were truly a separate dark matter halo, its lensing signal would persist indefinitely, SET predicts the trapped space flux eventually dilutes and the lensing peak must fade as the bubble catches up (millions of years), this is a signature that could be tested. Anyhow lets do the lag calculation:

BULLET SUBCLUSTER (fast bullet cloud) , tuned to Xray data

```
Mass,b    = 8.0e43            # kg   visible gas mass (Chandra fit)
Rshock    = 3.2e21            # m    current shock-edge radius  ≈105 kpc
R_l    = 5.5e21             # m    lens-centroid radius       ≈178 kpc
v_b    = 4.5e6              # m/s  proper speed of the bullet
b_arc  = 1.30e22              # m    impact parameter of giant arcs
```

$Qb = 4\pi\ Rshock^2\ \sqrt{(2GMass,b/Rshock)}$

$Qb = 2.351e+50\ m^3/s$

```
Vesc,b =  Qb / (4*pi*R_l**2)
Vesc,b = 618389.97 m/s
```

theta = $(2*vesc^2*Rshock)\ /(c^2*b)$
Theta = 2.09e-6 * arsec/rad
Arc deflection at θ_b = 0.43

Subcluster bubble of emanated space lag

```
t_flight = (R_l - Rshock) / v_b           time since core passage
t_flight = 511111111111111.1 seconds

R_bub = (Rshock**3 + 3*Rshock**2*Vesc_b*t_flight)**(1/3)

R_bub= 3.489e+21 meters
```

Flux lag in relation to bullet cluster speed

```
lag_1    = v_b*t_flight - (R_bub - Rshock)
lag_1    = 2.0108e+21 meters / kpc = 65.2 kpc
```

MAIN (CENTRAL) CLUSTER , symmetric King core approximation

M_m = 9.0e43 # kg baryonic mass of the main core
R0 = 6.8e21 # m core/β-model scale radius ≈220 kpc

Qb = 4π R0² √(2GMass,b/R0)
Qb = 7.723e50 m3/s

Vesc,main = Q_m / (4*pi*R_l**2)
Vesc,main = 2031781.98 m/s

lag_2 = (v_b - Vesc,main) * t_flight
lag_2 = 1.2615e+21 meters / kpc = 40.9 kpc

Total_lag = lag_1 + lag_2 = 106.1 kpc

This calculation is a proof of concept of SET. Although we have used static, spherical approximations (while this is better describe giving it a dynamical treatment). Nonetheless the calculations are sound and within SET postulates. And the numbers come out right. Even with these simplifications, SET's space flux reproduces the ~100 kpc offset without any dark matter.

Bullet Cluster Offset from SET (ansatz using exact bubble growth)

In the previous 106 kpc estimate I used a longer flight time (5.11×10^15 s) and a shortcut growth term R_shock²V_esc(R_l) in place of the SET constant Q/(4π), which slows the bubble. Using the exact SET growth law $R^3 = R_shock^3 + 3(Q/4\pi)t$ with the correct t_flight = 5.11×10^14 s gives R_bub ≈ 128 kpc and a total lag ≈ 91 kpc, which is still within the observed 100–125 kpc to order unity.

Observables:
Bullet subcluster (gas) mass
M_b = 8.0×10^{43} kg; shock radius
R_shock = 3.2×10^{21} m (≈105 kpc); lens centroid radius
R_l = 5.5×10^{21} m (≈178 kpc)
bullet speed v_b = 4.5×10^{6} m/s.
Main cluster (gas) mass
M_main = 9.0×10^{43} kg; core scale
R_0 = 6.8×10^{21} m (≈220 kpc).

Flux from the bullet at the shock edge (Axiom 3):
Q_b = 4 π R_shock² √(2 G M_b / R_shock)

$Q_b = 2.351\times10^{50}$ m^3/s.

Exact SET bubble growth (holding Q_b constant over the short flight time):
$dR/dt = Q_b / (4 \pi R^2) \Rightarrow R(t)^3 = R_{shock}^3 + 3 (Q_b / 4\pi) t$.

Flight time from R_shock to R_l:
$t_{flight} = (R_l - R_{shock}) / v_b = 5.111\times10^{15}$ s ≈ 16.2 Myr.
Bubble radius at t_flight:
$R_{bub} = [R_{shock}^3 + 3 (Q_b / 4\pi) t_{flight}]^{(1/3)} = 3.95\times10^{21}$ m ≈ 127.9 kpc.

Lag from finite bubble growth:
$lag_1 = R_l - R_{bub} = 1.56\times10^{21}$ m ≈ 50.4 kpc.

Additional drift from the main cluster's outward flow (simple kinematic term):
$Q_{main} = 4 \pi R_0^2 \sqrt{(2 G M_{main} / R_0)} = 7.723\times10^{50}$ m^3/s.
$V_{esc,main}(R_l) = Q_{main} / (4 \pi R_l^2) = 2.032\times10^6$ m/s (≈2032 km/s).
$lag_2 = (v_b - V_{esc,main}) \cdot t_{flight}$
$lag_2 = 1.26\times10^{21}$ m ≈ 40.9 kpc.

Total offset (SET ansatz):
$Total_{lag} = lag_1 + lag_2 \approx (1.56 + 1.26)\times10^{21}$ m ≈ 2.81×10^{21} m ≈ 91.3 kpc.

This SET calculation using only (v_b – V_esc,main) and the exact SET growth law for the space flux bubble(without dark matter, no fitted parameters) lands at ~91 kpc, within the observational 100–125 kpc range to order unity accuracy/not orders of magnitude apart/of comparable scale, the reason I stretch this point is that unless there is some physical truth to SET, it is unlikely to get so many several accurate results matching observations throughout an array of different calculations describing multiple realm phenomena. With the same formula. As the solutions, and perfect reconciliation of the formulas with classical formulas stack up. Just by mere probability I find it hard to discard SET.

To derive gravitational parameter from the main formula

GM = (Q**2) / (32 * (math.pi**2) * R**3)

Deflection angle formula for light

Time dilation factor = factor = (1 - (2 * G * M)/(R * c**2))

theta = (Q**2) / (8 * (math.pi**2) * (c**2) * b * (R**3)) * time dilation factor

theta = (2*vesc^2*R) /(c^2*b)

Frame dragging formula

omega= angular velocity
J= angular momentum

$\omega = (Q^2 J) / (16 \pi^2 c^2 r^3 R_0^3 M)$

$M\oplus = 5.972\times10^{24}$ kg, $R\oplus = 6.371\times10^{6}$ m, $\Omega\oplus \approx 7.292\times10^{-5}$ s^{-1}
Earth spin angular momentum $J \approx 0.3308\ M\oplus\ R\oplus^2\ \Omega\oplus$
$R_0 = R\oplus$
From SET: $Q^2 = 32\ \pi^2\ R_0^3\ G\ M\oplus$.

Two altitudes:
Gravity Probe B–like: $r \approx R\oplus + 642$ km $= 7.013\times10^{6}$ m
LAGEOS–like: $r \approx R\oplus + 5900$ km $= 1.227\times10^{7}$ m

Both ways agree,
$r = 7.013\times10^{6}$ m:
$\omega = 2.5179\times10^{-14}$ rad/s → 163.90 mas/yr (inertial frame rate)
$r = 1.227\times10^{7}$ m:
$\omega = 4.7001\times10^{-15}$ rad/s → 30.59 mas/yr

That 30.6 mas/yr is the LAGEOS nodal frame dragging scale (31 mas/yr), so the SET formula reproduces the standard GR prediction exactly, as it should.

Angular momentum

```
J = (Q**2 * omega) / (80 * (math.pi**2) * G * R)
```

To derive V_orb (circular/orbital speed) from space emanation

Start from the SET flux–escape relation on a spherical readout surface R:
$Q = 4\pi R^2 \sqrt{(2GM/R)}$.

Identify the escape speed at R:
$V_{esc}(R) = Q / (4\pi R^2)$.

Relate circular speed to escape speed:
$V_{orb}(R) = V_{esc}(R) / \sqrt{2}$.

Substitute and simplify:
$V_{orb}(R) = (1/\sqrt{2}) \cdot Q/(4\pi R^2)$
$= Q/(4\sqrt{2} \cdot \pi R^2)$
$= Q/(\sqrt{32} \cdot \pi R^2)$.

Using $GM = Q^2/(32\pi^2R^3)$:
$V_{orb}(R) = \sqrt{(GM/R)} = \sqrt{(Q^2/(32\pi^2R^4))} = Q/(\sqrt{32} \cdot \pi R^2)$.

(For non-spherical readouts replace $4\pi R^2$ by the effective area $A_{eff}(\Sigma)$:
$V_{orb}(\Sigma) = (1/\sqrt{2}) \cdot Q / A_{eff}(\Sigma)$.)

To derive ϕ (gravitational potential) from space emanation

Start from the SET flux–escape relation on a spherical source surface R:
$Q = 4\pi R^2 \sqrt{(2GM/R)}$

Square both sides:
$Q^2 = (4\pi R^2)^2 \cdot (2GM/R) = 16\pi^2 R^4 \cdot (2GM/R) = 32\pi^2 G M R^3$.

Solve for GM:
$GM = Q^2 / (32\pi^2 R^3)$.

Divide by R to get the potential scale:
$GM/R = Q^2 / (32\pi^2 R^4)$.

Thus the Newtonian potential is
$\phi(R) = -GM/R = - Q^2 / (32\pi^2 R^4)$.

Using $V_{esc}(R) = Q / (4\pi R^2)$,
$V_{esc}^2 = Q^2 / (16\pi^2 R^4) = 2GM/R$,
so
$\phi(R) = -\frac{1}{2} V_{esc}^2 = - Q^2 / (32\pi^2 R^4)$.

To derive the gravitational formula:

We know $g = V_{esc}^2/(2 r)$. Calibrate GM once at the source surface R_0 via
$GM = Q^2 / (32 \pi^2 R_0^3)$

Escape speed (weak field, using GM at r)
$V_{esc}^2(r) = 2 G M / r = Q^2 / (16 \pi^2 R_0^3 r)$

Surface gravity (set $r = R_0$)
$g_{surface} = Q^2 / (32 \pi^2 R_0^5)$

Far-field readout (compute Q at R_0, evaluate at R_x)
$g_{far_field} = [Q^2 / (32 \pi^2 R_0^3)] \cdot (1 / R_x^2)$

Strong field (exact; recommended for compact objects)
$g_{exact}(r) = [Q^2 / (32 \pi^2 R_0^3)] / [r^2 \cdot \sqrt{(1 - Q^2 / (16 \pi^2 R_0^3 c^2 r))}]$

Equivalently, $g_{exact}(r) = G M / [r^2 \cdot \alpha(r)]$ with $\alpha(r) = \sqrt{(1 - Q^2 / (16 \pi^2 R_0^3 c^2 r))}$

To derive the Time dilation:

From the SET invariant you can get several calculations
$c^2 = V_{space}^2 + V_{time}^2$.

Spherical split:

$c^2 = (\sqrt{(2GM/R)})^2 + V_time^2$
$\rightarrow V_time^2 = c^2 - 2GM/R.$

Meters/time = $\sqrt{(c^2 - 2GM/R)}$.
time/meters = $1 / \sqrt{(c^2 - 2GM/R)}$.

If you normalize to one light-second (299 792 458 meters), you can write
time = 299 792 458 meters / $\sqrt{(c^2 - 2GM/R)}$ = seconds (time-dilation readout).

Substitute the Q–R_0 relation $GM = Q^2/(32\,\pi^2\,R_0^3)$:

General radius r:
time = 299 792 458 meters / $\sqrt{(\,c^2 - Q^2 / (16\,\pi^2\,R_0^3\,r)\,)}$

On the calibration surface $r = R_0$:
time = 299 792 458 meters / $\sqrt{(\,c^2 - Q^2 / (16\,\pi^2\,R_0^4)\,)}$

Normalize by c to get the dimensionless clock factor ("Time" ≡ 1/α):

Time = $1 / \sqrt{(\,1 - Q^2 / (16\,\pi^2\,R_0^4\,c^2)\,)}$
Time = $1 / \sqrt{(\,1 - (Q^2 / Q_set^2)\,)}$
Time = $1 / \sqrt{(\,1 - (Q^2 / (4\pi R_0^2\,c)^2)\,)}$
Time = $1 / \sqrt{(\,1 - (Q^2 / (A_eff\,c)^2)\,)}$

This last form is equivalent to GR's compactness ratio R_s/R because
$Q^2 / Q_set^2 = V_esc^2 / c^2 = 2GM/(c^2\,R) = R_s / R$,
with Q_set = A_eff c (and for a sphere, $A_eff = 4\pi R^2$).
(Important fix: the equivalence uses Q_set, not Q_c.)

Seconds extend/last longer due to gravitation. If you normalize using c you get the (dimensionless) factor
Gamma = $1 / \sqrt{(\,1 - 2GM/(R\,c^2)\,)}$.

SET's interpretation is that gravitational time dilation happens because space mass interactions occur at the speed limit c; these interactions are affected either by the observer's motion through space or by space moving through the observer due to emanation. Velocity causes the interactions between space and mass to be delayed; hence all mass tied events are delayed. There is a Doppler type shift in the rate of information/interaction exchange between mass and observer, leading to events taking longer to happen.

To be clear there are three expressions at play above

$R_s = 2GM/c^2$ → Schwarzschild radius (mass scale at which a horizon appears).
$Qset = 4\pi R_0^2\,c$ → "flux capacity" of a surface at speed c.
Also Q_set = A_eff c (same formula; $A_eff = 4\pi R_0^2$ for a sphere).
$M = (R_0\,c^2)/(2G)$ → mass needed on any enclosing surface for |S| to reach c there.
$Q_c = 4\pi\,R_s^2\,c$ → physical horizon flux of a black hole per second.
Equivalently $Q_c = (16\,\pi\,G^2\,M^2) / c^3$ (same, written in terms of M).

Flux capacity as a calibration (the SET analogue of Schwarzschild radius)

In GR one quotes the Schwarzschild radius $R_s = 2GM/c^2$ as a compactness yardstick even when no horizon exists. SET has the parallel notion: for any chosen enclosing surface Σ with effective area $A_{eff}(\Sigma)$, define the flux capacity
$Q_{set}(\Sigma) = A_{eff}(\Sigma) \cdot c$,
the maximum causal volumetric throughput that surface could carry if it were a horizon ($|S| \to c$). Ordinary bodies satisfy $Q \ll Q_{set}$.

This yields a clean, dimensionless compactness on that same surface:
$\chi_\Sigma = (Q / Q_{set}(\Sigma))^2$.

For a spherical source surface of radius R_0 (the physical boundary used for calibration, Axiom 3), this reduces to
$\chi = 2GM/(R_0 c^2) = R_s / R_0$.
For general Σ (disk, oblate shell, etc.), χ_Σ remains a valid geometry-dependent diagnostic/ revision but should not be read as R_s/R unless Σ is the spherical source surface.

Surface average lapse diagnostic on Σ:
$\bar{\alpha}_\Sigma = \mathrm{sqrt}(1 - (Q / Q_{set}(\Sigma))^2)$.

Invariant bookkeeping (two complementary forms)

Local (pointwise) invariant:
$c^2 = V_{space}(x)^2 + V_{time}(x)^2$,
with V_{space} the local space-speed magnitude. In spherical vacuum one may write the escape-speed driver $V_{space}(r) = \sqrt{(2GM/r)}$.

Surface-average identity on a fixed Σ:
$c^2 = (Q/A_{eff}(\Sigma))^2 + V_{time,avg}(\Sigma)^2$.
Equivalently $\bar{\alpha}_\Sigma \equiv V_{time,avg}/c = \mathrm{sqrt}(1 - (Q/(A_{eff}\, c))^2)$, so the surface average "time-stretch" is
$\mathrm{Time}_\Sigma = 1/\bar{\alpha}_\Sigma = 1/\mathrm{sqrt}(1 - (Q^2/(A_{eff} \cdot c)^2))$.
Use this only as a Σ-average diagnostic on that fixed surface; not to be promoted to the local driver away from Σ.

Important naming. Qset is a calibration object (capacity on an arbitrary surface). The actual horizon flux of a black hole is a physical quantity we denote Qc,
$Q_c = 4\pi R_s^2 c$.

Interpretation and limit. Use Qset exactly as one uses Rs for ordinary bodies: as a normalization on the chosen Σ. When Σ is the true horizon ($A_{eff} = 4\pi R_s^2$), the physical flux saturates the causal cap and $Q = Q_c$. For any other surface, Qset remains a normalization, not a dynamical flux. unless the enclosed mass on a spherical surface of radius R_0 reaches $M_s = (R_0 c^2)/(2G)$, the threshold at which $|S| \to c$ on that surface.

One conserved thing (flux):

$\iint_{(\Sigma)} S \cdot dA = \iiint_{(V)} \sqrt{(24\pi G \rho)}\, d^3x \equiv Q \quad [m^3/s]$.

This fixes a single, global throughput Q for the baryons, independent of which enclosing surface Σ is pick.

One calibration (escape speed on the source surface) Axiom 3:
At a chosen spherical source surface R_0,
$\bar{S}(R_0) = Q/(4\pi R_0^2)$ is set equal to the usual escape speed $\sqrt{(2GM/R_0)}$.

$\sqrt{(2GM/R_0)} = Q/(4\pi R_0^2)$

That gives a clean algebraic bridge between flux and mass:
$GM = Q^2 / (32\pi^2 R_0^3)$.

The outward space speed that the same mass implies at radius r,
$V_{space}(r) = \sqrt{(2GM/r)} = \sqrt{([Q^2/(16\pi^2 R_0^3)] \cdot 1/r)}$.

If we apply the timelike norm (Axiom 2) as a simple Pythagorean budget
$c^2 = V_{space}^2 + V_{time}^2$.

The gravitational lapse is just the remaining clock factor, after we normalize using c(divide both sides by the speed of light:
$\alpha(r) = V_{time}/c = \sqrt{(1 - V_{space}(r)^2/c^2)}$
$\alpha(r) = \sqrt{(1 - [Q^2/(16\pi^2 R_0^3 c^2)] \cdot 1/r)}$.

And gravity is the gradient of that clock factor:
$a(r) = g(r) = c^2 \, d(\ln \alpha)/d\ell$

Qset the Rs analogue and parallel uses

What Qset does.
For any enclosing surface Σ with effective area $A_{eff}(\Sigma)$, define the flux capacity
$Q_{set}(\Sigma) = A_{eff}(\Sigma) \cdot c$.
This is the maximum causal volumetric throughput that surface could carry if |S| reached c. Ordinary bodies have $Q \ll Q_{set}$. Use Qset exactly as Rs is used in GR, a compactness yardstick on that fixed surface.

Calibrate once on a spherical source surface R_0 (the physical boundary):
$Q_{set}(R_0) = 4\pi R_0^2 c$.
Define an effective Schwarzschild scale expressed through SET flux:
$R_{s,eff} \equiv (Q / Q_{set}(R_0))^2 \cdot R_0$.
This equals the usual R_s because
$R_s = 2GM/c^2 = Q^2 / (16\pi^2 R_0^3 c^2) = (Q / Q_{set}(R_0))^2 \cdot R_0$.

With that single identification, standard GR weak-field formulas carry over by replacing R_s with $R_{s,eff}$ (or writing directly in terms of $(Q / Q_{set}(R_0))^2 \cdot R_0$). The replacement is valid for the spherical exterior after the R_0 calibration; do not slide $R_0 \to r$.

(SET, with $R_s \to R_{s,eff} = (Q / Q_{set}(R_0))^2 \cdot R_0$):

Compactness / weak-field parameter:
$\varepsilon_{SET} \equiv [(Q / Q_{set}(R_0))^2 \cdot R_0] / r \ll 1$.

Escape speed (dimensionless):
$v_{esc} / c = \mathrm{sqrt}([(Q / Q_{set}(R_0))^2 \cdot R_0] / (2r))$.

Gravitational redshift / lapse (spherical exterior):
$\alpha(r) = \mathrm{sqrt}(1 - [(Q / Q_{set}(R_0))^2 \cdot R_0] / r)$;
for $[(Q / Q_{set}(R_0))^2 \cdot R_0] \ll r$, $z \approx \frac{1}{2} \cdot [(Q / Q_{set}(R_0))^2 \cdot R_0] / r$.

Light deflection (impact parameter b):
$\Delta\theta \approx 2 \cdot [(Q / Q_{set}(R_0))^2 \cdot R_0] / b$.

Shapiro delay:
$\Delta t \approx \{ [(Q / Q_{set}(R_0))^2 \cdot R_0] / c \} \cdot \ln(4 r_E r_R / b^2)$.

so
$R_{s,eff} = Q^2 / (16\pi^2 R_0^3 c^2)$.

To derive the redshift:

$c^2 = (\sqrt{(2GM/R)})^2 + V_{time}^2$.

Solve for the time share:
$V_{time}^2 = c^2 - 2GM/R$, so
$V_{time} = \sqrt{(c^2 - 2GM/R)}$.

Define the lapse (clock factor):
$\alpha(R) \equiv V_{time}/c = \sqrt{(1 - 2GM/(c^2 R))}$.

Gravitational redshift (receiver at infinity):
$1 + z = 1/\alpha(R) = c / \sqrt{(c^2 - 2GM/R)} = 1 / \sqrt{(1 - 2GM/(c^2 R))}$.

In Q–R_0 language (using $GM = Q^2/(32 \pi^2 R_0^3)$):
$\alpha(r) = \sqrt{(1 - [Q^2/(16 \pi^2 R_0^3 c^2)] \cdot 1/r)}$.

Then:
General two-radius form (emitter at r_e, receiver at r_r):
$1 + z = \alpha(r_r)/\alpha(r_e)$.

Receiver at infinity ($r_r \to \infty$):
$z_{far} = 1 / \sqrt{(1 - Q^2/(16 \pi^2 R_0^3 c^2 r_e))} - 1$.

Evaluated right on the calibration surface ($r_e = R_0$, $r_r \to \infty$):
$z_{surface} = 1 / \sqrt{(1 - Q^2/(16 \pi^2 R_0^4 c^2))} - 1$.

If we want to know why light covers less meters per second of the outside observer, this relationship explains that as seconds are extended meters are reduce for c to maintain its constant value

In SET there is a single invariant budget $c^2 = |S|^2 + V_{time}^2$. In the cosmic time bookkeeping frame, the outward emanation field $|S|$ uses part of that c^2 budget, leaving a tangential coordinate light speed $c \cdot \alpha$ with $\alpha(r) = \text{sqrt}(1 - 2GM/(c^2 r))$. A distant cosmic time/non dilated hypothetical observer therefore sees a photon cover fewer tangential meters per cosmic second, the extra travel time is the Shapiro delay, and the cumulative frequency stretch is the gravitational/cosmological redshift. Locally, nothing exotic happens, a comoving proper observer still measures light at c. Their seconds are longer by $1/\alpha$. These are two descriptions of the same light path. In this sense, meters eaten by the radial flux as if the path is stretched, much like a lantern aimed at a receding mirror. That is a valid coordinate intuition IMO for how

the conserved flux Q stretches paths and times, while the lapse α remains the dynamical driver that links clocks, frequencies, and delays.

To understand light constancy independent of it covering less meters, no curvature:

Start from the invariant $c^2 = Vspace^2 + Vtime^2$
Vtime = $\sqrt{(c^2 - 2GM/R)}$
m/s = $\sqrt{(c^2 - 2GM/R)}$

299792458 meters / 1 second = $\sqrt{(c^2 - 2GM/R)}$
1 second / 299792458 meters = $1 / \sqrt{(c^2 - 2GM/R)}$
1 second = 299792458 meters / $\sqrt{(c^2 - 2GM/R)}$ → M,R will affect that second
If you calculate both formulas for earth
L = sqrt ((c^2 - 2GM/R))/1 second
t = 299792458 meters / (sqrt(c^2 - 2GM/R))

Since c is both meters as well as seconds you get:
c = 299792457.79 meters / 1.0000000007 seconds , as seconds are extended due to the

Normalize version(classical)
Start from the invariant:

$c^2 = V_{space}^2 + V_{time}^2$.
$V_{space}^2 = 2GM/R$ (units: m^2/s^2).

Solve for the time component:
$V_{time} = \sqrt{(c^2 - 2GM/R)}$ [m/s].

Normalize by c to get the lapse (clock factor):
$\alpha \equiv V_{time} / c = \sqrt{(1 - 2GM/(c^2R))}$.

Clock relation (local vs. distant):
$d\tau/dt = \alpha$ (local proper second runs slower by α).

Horizontal light as seen by a distant observer:
$v_{horiz} = c \cdot \alpha = \sqrt{(c^2 - 2GM/R)}$ [m/s].

Locally, light still covers 299 792 458 m each proper second; a far observer sees fewer meters per far-second by the factor α because part of the c^2 budget is in $V_{space}^2 = 2GM/R$.

In a gravitational field the meters cover by light decrease as perceived by the outside observer, for the local observer, light covers exactly its normal distance per their second, preserving the constancy of c without invoking curved spacetime. For this calculation we used earth. In SET light always covers the distance of 299792458 meters every second even near the event horizon. Because emanated space is consider traveled space. Such that if you were to stand on the surface of a planet with a very strong gravitational field and point a flashlight horizontally the outside observer would perceive the light as covering a shorter distance. Even though the whole distance was cover. Imagine standing on the surface of planet X with a vertical velocity of emanation/escape velocity of 2000000 meters/second. The outside observer would perceive

light as traveling horizontally 99792458 meters every second. The remaining distance was travel inadvertently given the emanation. Thus, no curved geometry is needed, the constancy of c is preserved through space mass interactions and time extension.

More precisely
For a static observer at radius R the local flux speed is
$V_{space}(R) = \sqrt{2GM/R}$
Their proper second is stretched relative to a distant second
$dr/dt = \sqrt{1 - (2GM/(c^2R))}$
So the distant observer says the photon covers
$V_{space}/ (dr/dt) = c$

Close to the massive surface the second is longer and distance is larger, so the photon seems to traverse fewer meters per second of the outside observer.

To calculate the size of the observable universe

Q = (math.sqrt(24 * math.pi * G) * M) / math.sqrt(rho) , Q using density instead of radius

This is the time dilation factor derive by replacing the radius with density:

Time_correction = 1 / math.sqrt(1 - (8 * math.pi * G * rho / (3 * c**2)) * ((3 * M / (4 * math.pi * rho)) ** (2/3)))

Qtotal = Q * Time_correction

Total size of the universe = Qtotal * 13.8 billion years in seconds

Other Solutions for flat rotation curves of galaxies calculated by SET using mass and radius without adhoc solutions like dark matter or MOND tinkering of the gravitational constant.

Quadrupole formula for SET

P_GW_SET = (Q1**4 * Q2**4 * ((Q1**2)/R1**3 + (Q2**2)/R2**3)) / (5 * (32**4) * (pi**10) * (c**5) * G * (r_orbit**5) * (R1**6) * (R2**6))

to calculate Q emanation for the black hole for this case we can use the simplify

$Q=4\pi R_s^2 c$ (using Schwarzschild radius)
$Q = (16\pi G^2 M^2) / (c^3)$ (using BH mass)d

Rs= Schwarzschild radius

c= speed of light

The LIGO energy loss rate is recovered without invoking curvature. it is a direct consequence of flux conservation.

To calculate Shapiro delay

$\Delta t_set = [Q^2 / (16 \pi^2 R_0^3 c^3)] \cdot \ln(4\ r_emitter \cdot r_receiver / b^2)$.

exactly the first-order GR result (PPN $\gamma = 1$), matching Cassini's 2.3×10^{-5} precision.

What light seems slower actually means here

Locally, the photon always moves at c = 299 792 458 m/s.

The extra time seen by a distant clock comes from the gravitational lapse (clock factor)

$\alpha(r) = \sqrt{(1 - 2GM/(c^2 r))}$.

Proper seconds near the mass are longer ($\alpha < 1$), so translating the photon's motion into distant time yields a longer coordinate travel time, the Shapiro delay.

In SET there is a single invariant budget $c^2 = |S|^2 + V_time^2$. In the cosmic-time bookkeeping frame, the outward emanation field |S| uses part of that c^2 budget, leaving a tangential coordinate light speed $c\cdot\alpha$ with $\alpha(r) = sqrt(1 - 2GM/(c^2 r))$. A distant (cosmic-time) observer therefore sees a photon cover fewer tangential meters per cosmic second; the extra travel time is the Shapiro delay, and the cumulative frequency stretch is the gravitational/cosmological redshift. Locally, nothing exotic happens: a comoving proper observer still measures light at c; their seconds are longer by $1/\alpha$. These are two descriptions of the same light path. In this sense, meters eaten by the radial flux as if the path is "stretched," much like a lantern aimed at a receding mirror. That is a valid coordinate intuition IMO for how the conserved flux Q stretches paths and times, while the lapse α remains the dynamical driver that links clocks, frequencies, and delays.

To calculate Kretschmann Scalar using SET.

$Kset(r) = (3 Q^4) / (64 \pi^4 R_0^6 c^4 r^6)$.

SET proposes that what we perceive as spacetime curvature in GR can be explained through the dynamic emanation of space. This process creates the effects we interpret as curvature, but with a different underlying mechanism. Curvature appears as a derived composite of the flux field, not as a fundamental geometric input.

Energy ledger from Axiom 2(SET's invariant)

Invariant (Axiom 2):

$c^2 = V_{space}^2 + V_{time}^2$, with lapse $\alpha \equiv V_{time}/c$.

Spherical static link (Axiom 3):

$V_{space}^2 = 2GM/R \Rightarrow \alpha(R) = \sqrt{(1 - 2GM/(R c^2))}$.

Quadratic split (exact identity; multiply by m/2 for the kinetic-energy form):

$(1/2)\, m\, c^2 = (1/2)\, m\, V_{space}^2 + (1/2)\, m\, V_{time}^2$

$= GM\, m / R + (1/2)\, m\, c^2\, \alpha^2$.

Note: the $(1/2)\, m\, c^2$ on the left is just a convenient constant from the identity, not a new physical "half rest-energy."

Include motion (local speed v, $\gamma \equiv 1/\sqrt{(1 - v^2/c^2)}$; clocks $d\tau/dt = \alpha/\gamma$):

replace $\alpha \rightarrow \alpha/\gamma$ in the time piece:

$(1/2)\, m\, c^2 = GM\, m / R + (1/2)\, m\, c^2\, (\alpha^2 / \gamma^2)$.

Weak-field, low-speed expansion ($\alpha^2 \approx 1 - 2GM/(R c^2)$, $1/\gamma^2 \approx 1 - v^2/c^2$):

$(1/2)\, m\, c^2\, (\alpha^2/\gamma^2) \approx (1/2)\, m\, c^2 - GM\, m / R - (1/2)\, m\, v^2$

(neglecting cross-terms $\sim (GM/(R\, c^2))\cdot(v^2/c^2)$).

Thus $E_{time} \equiv (1/2)\, m\, V_{time}^2 \approx (1/2)\, m\, c^2 - GM\, m / R - (1/2)\, m\, v^2$.

The invariant partitions a fixed reference ($(1/2)\, m\, c^2$) into gravitational GMm/R and kinematic $(1/2)\, m\, v^2$ withdrawals from the time piece. Kinetic energy appears automatically when motion is present; no extra postulates are needed. As you consume Vtime budget every increment of Vspace becomes more taxing, drastically so in the strong field

Qkerr, for rotating Black Holes

$a = J / (M c)$
$Q = 4\pi(r^2 + a^2)c$

Schwarzschild area $A = 16\pi(GM/c^2)^2$

Extremal Kerr area $A = 8\pi(GM/c^2)^2$

At fixed mass spinning up a Kerr Black Hole shrinks the horizon

Schwarzschild (non rotating):

$A = 4 \pi R_s^2$, $V = (4/3) \pi R_s^3$, $Q = A c$.

Plugging into the identity above gives the compact law

$\rho_{eff} = 3 c^2 / (8 \pi G R_s^2)$.

And, with $R_s = 2 G M / c^2$,

$\rho_{eff} = 3 c^6 / (32 \pi G^3 M^2)$.

$\rho_{eff} \propto 1/M^2$ (bigger holes are lighter inside).

Kerr (rotating):

Use the horizon area $A = 4 \pi (r_+^2 + a^2)$, with

$r_+ = GM/c^2 + \sqrt{(GM/c^2)^2 - a^2}$, $a = J/(M c)$.

Define an effective radius R_{eff} by $A = 4 \pi R_{eff}^2 \Rightarrow R_{eff} = \sqrt{r_+^2 + a^2}$.

$V_{eff} = (4/3) \pi R_{eff}^3$ as the interior volume.

Then the same boundary match gives

$\rho_{eff}(Kerr) = 3 c^2 / (8 \pi G R_{eff}^2)$.

Because A (and thus R_{eff}) decreases as spin rises at fixed M, rotation makes R_{eff} smaller and therefore raises ρ_{eff}.

At fixed mass, a faster spinning BH has a smaller throughput area/event horizon at capacity, so the interior must present a higher effective density to keep the causal mixing running at $Q = A c$.

Mixing tax per unit volume goes up when Q goes down

Rotation it seems stresses the boundary as it does the boundary of a fast moving ship. So mixind tax goes up, the pump needs a higher density to pump at c.

Volumetric cost, the mixing pressure or energy density per minted m^3) is

$\epsilon_V(a) = \hbar c^3 / [960 \cdot Q(a)^2] = \hbar c / [15360 \cdot \pi^2 \cdot R_{eff}^4]$

Rotation lowers A, thus lowers Q, therefore raises ϵ_V. A clean diagnostic is the spin-gain factor:

$\epsilon_V(a) / \epsilon_V(0) = [A(0) / A(a)]^2 = [R_s^2 / R_{eff}^2]^2$

$(R_s = 2GM/c^2)$

Spin stresses the boundary, the mixing tax grows like $1/A^2$.

Surface gravity (kappa):
$\kappa(a) = [\, c^2 (r_+ - r_-) \,] / [\, 2 (r_+^2 + a^2) \,]$ m/s²

Hawking temperature:
$T_H(a) = (\hbar / 2\pi\, k_B\, c) \cdot \kappa(a)$

Horizon area and capacity:
$A(a) = 4\pi (r_+^2 + a^2)$
$Q(a) = A(a) \cdot c$

Sbit cadence and energy per sbit
$\dot{N}(a) \propto Q(a) \propto A(a)$
$\Delta E_{sbit}(a) \propto k_B \cdot T_H(a) \propto \kappa(a)$

Power scaling consistent with Kerr thermodynamics
$P(a) = \dot{N}(a) \cdot \Delta E_{sbit}(a) \propto A(a) \cdot \kappa(a)$

As spin rises, κ falls and P(a) decreases, vanishing at extremality , while the local “mixing cost” per m³, $\varepsilon_V(a) \propto 1/Q(a)^2 \propto 1/A(a)^2$, increases.

SET tidal law (radial gradient, stresses, and strength limit)

$Q = 4\pi R^2 \sqrt{(2GM/R)}$
$q = \sqrt{(2GM \cdot R^3)}$ (per-steradian kernel

$R_s = 2GM/c^2 = Q^2/(16\pi^2 R^3 c^2) = q^2/(R^3 c^2)$
$\chi \equiv R_s/r = Q^2/(16\pi^2 R^3 c^2 r) = q^2/(R^3 c^2 r)$

$\alpha(r) \equiv \sqrt{(1 - \chi)}$ (lapse; domain $0 \le \chi < 1$)

Tidal gradient (static hover frame, along the radial proper line $d\ell = dr/\alpha$):

$T_{SET}(r) = d\, a / d\ell = -(2GM/r^3) \cdot (1 - 3\chi/4)/(1 - \chi)$ [s^{-2}]

Equivalent SET forms:

$T_{SET}(r) = -(Q^2/(16\pi^2 R^3 r^3)) \cdot (1 - 3\chi/4)/(1 - \chi)$

$T_{SET}(r) = -(q^2/(R^3 r^3)) \cdot (1 - 3\chi/4)/(1 - \chi)$

Weak-field limit ($\chi \to 0$):

$T_{SET}(r) \to -(2GM/r^3) = -(Q^2/(16\pi^2 R^3 r^3)) = -(q^2/(R^3 r^3))$.

Strong-field amplification:

$A(\chi) \equiv (1 - 3\chi/4)/(1 - \chi) \Rightarrow T_{SET}(r) = -(2GM/r^3) \cdot A(\chi)$.

Tidal acceleration across size L:

$a_{tide} \approx |T_{SET}(r)| \cdot L$ [m s^{-2}]

Tidal stress and strain (material model):

$\sigma_{tide} \approx \rho_{mat} \cdot L^2 \cdot |T_{SET}(r)|$

$\varepsilon \approx \sigma_{tide} / E$

Strength-limited Roche distance (weak field; SET form):

$r_{strength} \approx \{ [\rho_{mat} \cdot q^2 \cdot L^2] / [R^3 \cdot S_y] \}^{(1/3)}$

With strong-field boost (evaluate A at the resulting r):

$r \approx \{ [\rho_{mat} \cdot q^2 \cdot L^2] / [R^3 \cdot S_y] \}^{(1/3)} \cdot A(\chi)^{(1/3)}$

SET Ringdown Frequency
Numerical Example

Black Hole Mass= 1.23e32 kgs

Spin: a=0.68.

Calculated:

Schwarzschild radius: 1.83e+05 m

Emanation rate: Q = 1.25e20 m^3/s

Substituting into the SET formula yields= 288 Hz

G = 6.6743e-11 m^3 kg^-1 s^-2
c = 299792458 m/s

Example final BH parameters (like a post-merger remnant)
a = 0.68 dimensionless spin (0 <= a < 1)

Schwarzschild radius R = 2GM/c^2 (if you intend to set R = R_s)

R = (2.0 * G * M_f) / (c**2)

Emanation rate for BH using the mass (SET):
Q = (16 * pi * G^2 * M_f^2) / c^3

Emanation rate using radius;
Q= 4*pi*Rs^2*c

Now use the proposed formula:

f_{220}set = (16 * pi * c^3 * Rs^3 / Q^2) * [1 - 0.63(1-a)^0.3]

f_(220)GR =((c^3) / (2*pi*GM)) * (1 - 0.63(1 - a)^0.3)

SET based ringdown frequency f_220: 287.89 Hz

matching LIGO's measured 287 +- 12 Hz for GW150914. Only the flux gives us the coefficient, no Kerr metric is invoked. I show this calculation as a consistency check, rather than a new prediction. Its value lies in confirming that a single parameter Q that explains flat rotation curves, and expansion can reproduce strong field ring down physics without tuning.

What follows below, is an exploration of the theory, for the purpose of revising whether SET reconciles naturally with other frameworks such as Hawking radiation and holographic principles. Whether discretization of space turns out to be empirically testable (real or not), it does not alter SET axioms. So this exploration is safe and in within the framework.

Hawking radiation and SET derivation

Capacity/flux at a Schwarzschild horizon

SET takes the event horizon as a causal surface with an outward flux speed c/ emanated space,

$Q = 4\pi R_s^2 c$, with $R_s = 2GM/c^2$

Gives,

$Q = (16\pi G^2 M^2) / c^3 \ \ m^3/s$

By looking at SET formula for emanation of a BH using its mass, I found a resemblance to Hawking mass loss so I went and reconcile both identities.

Standard Hawking loss:

$dM/dt = -\hbar c^4 / (15360 \pi G^2 M^2)$.

Multiply by Q:

$Q\cdot(dM/dt) = [(16\pi G^2 M^2)/c^3] \cdot [-\hbar c^4 /(15360 \pi G^2 M^2)]$

$= -\hbar c / 960$.

So the SET Hawking formula is:

$Q\cdot(dM/dt) = -\hbar c / 960$

$dM/dt = -(\hbar c)/(960 Q)$

Energy rate and mixing cost per volume. New space stitches to existing boundary

Energy loss: $dE/dt = c^2 dM/dt = -(\hbar c^3)/(960 Q)$.

Divide by the volumetric rate $dV/dt = Q$ to get the energetic cost per cubic meter of newly assimilated space:

$\varepsilon_V \equiv (dE/dt)/(dV/dt) = (\hbar c^3)/(960 Q^2)$.

At a Schwarzschild horizon where $Q = 4\pi Rs^2 c$,

$\varepsilon_V = (\hbar c^3) / [960 \cdot (16 \pi^2 Rs^4 c^2)] = (\hbar c) / (15360 \pi^2 Rs^4)$.

The horizon pays this positive mixing energy density, the BH mass decreases.

Thermal explanation SET short

Using the usual $\kappa = c^2/(2R_s)$ and $T_H = \hbar \kappa/(2\pi k_B c) = \hbar c^3/(8\pi G k_B M)$, the power equals

$P = (dE/dt) = A \sigma_H T_H^4$
(with the greybody/Stefan-like factor rolled into the 1/15360), and the entropy flow obeys

$dS_{emit}/dt = P / T_H = - dS_{BH}/dt$.

The radiation's entropy rise exactly matches the BH's entropy loss.

Lifetime and the single constant K

Write Hawking loss as $dM/dt = - K / M^2$ with

$K = \hbar c^4 / (15360 \pi G^2)$.

Then the lifetime is

$t_{evap} = 5120 \pi G^2 M_0^3 / (\hbar c^4)$.

Total volume emitted over the whole evaporation

Q depends on M. So the total emitted volume is

$V_{total} = Q\, dt = [(16\pi G^2 M^2)/c^3] \cdot [- M^2\, dM / K]$

$= (16\pi G^2 / (c^3 K)) \cdot (M_0^5 / 5) =$ **$(49\ 152\ \pi^2 G^4 / (\hbar c^7)) \cdot M_0^5$**

A quick Quadrupole calculation using $Q= 4\pi R_s^2 c$

SET Quadrupole formula

$P_{GW_SET} = (Q_1^4 Q_2^4((Q_1^2/R_1^3)+(Q_2^2/R_2^3))) / (5(32^4)(\pi^{10})c^5 G(r_{orbit}^5)(R_1^6)(R_2^6))$

GW150914

M_1 = 36 M solar masses, M_2 = 29 M solar masses

Schwarzschild radii: $R_1 = 2GM_1/c^2$, $R_2 = 2GM_2/c^2$

Fluxes: $Q_i = 4\pi R_i^2 c$ (i = 1,2)

$r_{orbit} = 10 (R_1 + R_2)$

$R_1 \approx 1.0632 \times 10^5$ m

$R_2 \approx 8.5647 \times 10^4$ m

$Q_1 \approx 4.2586 \times 10^{19}$ m³/s

$Q_2 \approx 2.7635 \times 10^{19}$ m³/s

$r_{orbit} \approx 1.9197 \times 10^6$ m

P_GW_SET ≈ **4.43×10^{45} W**

Bekenstein Hawking formula and SET

S =(k_B*c^3*Area) / (4*hbar*G)

We substitute area with: 4*pi*Rs^2

S =(k_B*c^3*(4*pi*Rs^2)) / (4*hbar*G)

Simplifies to:

S = (π k_B c^3 R_s^2)/(ħ G)

We substitute Rs with 2GM/c^2:

S = (4π* k_B* GM^2) / (hbar* c)

From SET formula for emanation of a black hole using mass we get:

Q = (16piG^2M^2) / c^3

From the entropy formula we derive Mass:

M^2 =(S*hbar*c) / 4pi*Kb*G

Now we reconcile both formulas:

Q = (16piG^2) / c^3 * ((S*hbar*c) / 4pi*Kb*G)

This quantum relationship arises:

Q = (4*G*hbar* S) / (Kb*c^2)

My interpretation is that emanated space is directly proportional to the black hole's entropy which could be a measure of available quantum information translating in new space. This formula links quantum entropy with geometric space emanation.

Now lets solve both Q formulas derive from independent routes, one base on pure geometry using the area of the event horizon. Another using the quantum entropy content of a black hole.

We will the sun to solve both formulas:

Mass = 1.989e30 kgs
S = 1.45e54 J/K , for a solar mass black hole S value.

Q_set_entropy = (4 * G * hbar * S) / (k_B * c**2)

Q_set_bh = (16 * math.pi * G**2 * M**2) / c**3

Q_set_entropy= 3.287674098476147e+16 m3/s

Q_set_bh= 3.2876740984761464e+16 m3/s

The identical result from both formula is promising, showing that mass releasing entropy as space can be made quantitatively equivalent to the SET model. This could be consider a cross disciplinary consistency check. Space emanation as an entropy flow could be considered. And finally Hawking paradox due to the information loss problem, Expansion, and black hole evaporation could all be tie under the same principle. This derivations could indicate that the black hole has space emission.

Connecting SET to the Holographic principle and Hawking-Bekenstein formulas

We start with the Hawking-Bekenstein entropy formula

$S = (k_B * Area) / (4* planck_length^2)$

We define N as the number of planck areas lp^2 that the makeup the horizon/ surface as define by Hawking-Bekenstein

$N = Area / lp^2$

We substitute N into the entropy S formula we get

S = (k_B * N) / 4

In SET lets supposed each Planck area on the event horizon contributes to the emanation of space at a specific rate. The reasonable quantum scale for this would be a Planck Volume (lp^3) emitted over the Planck time

$tp = sqrt((G*hbar)/c^5)$

The rate of emission per Planck area would be

lp^3/tp which simplifies to G*hbar / c^2 = m^3/s

If each of the N planck areas emanated at this rate the total emanation should be

$Q = N* (lp^3/tp) = N * (G*\hbar)/c^2$

$Q = N * (G*\hbar)/c^2 = (area*G*\hbar / lp^2*c^2)$

$Q= (4*pi*Rs^2*G*\hbar / lp^2c^2)$

$N =(c^2 / (G*\hbar)) * Q$

We introduce SET , Q formula into the N derivation and we get:

$N_set_universal = (4\pi*R^2*sqrt(2GM/R) * c^2) / (G * \hbar)$

This could be consider when pondering about the entropy of masses that are not black holes. The mass entropy could be directly related to N. All the information regarding the mass could be hypothetically derive from its emanation. Thus SET links horizon entropy, planck area counting, and the geometric flux law in a single line, suggesting that sbits are the carriers of the emitted volume.

If we calculate N using the mass of the sun:

M = 1.989e30 kgs

N = 4.842300049e+85

With that result we can calculate $Q = ((G*\hbar)/ c^2) * N$, for the sun

Q= 3.792208219988203e+24 m^3/s volume of emanated space by the sun per second

From this, we can calculate the gravitational pull of the sun's surface

$g= Q^2 / (32 * \pi^2 * R^5)$

g= 271 m/s^2 the small difference from the actual 274m/s² is due to small rounding errors in the calculations

Furthermore we could derive the constant -hc/960Q directly from SET and Thermodynamics.

Evaporation Law from SET thermodynamics

Black hole horizon temperature and entropy

Surface gravity

$k= c^4 / (4GM)$

Hawking Unruh temperature

$T = hbar^* k / (2\pi^*k_B)$

Replace k you get

$T = hbar^*c^4 / (8\pi^*k_B^*G^*M)$

Horizon area is $A= 4\pi Rs^2 = 4\pi(2GM/c^2)^2$

Entropy in SET

$S = (k_Bc^3A) / (4hbarG)$ $A = 4\pi Rs^2 = 4\pi(2GM/c^2)^2$

Black body power flux

Energy density

$u = (\pi^{2*}k_B^4) / (15\hbar^3c^3) * T^4$

Assume the black hole horizon radiates as a perfect black body at temperature T with power per unit area, angle-averaged outward flux

$j = (1/4)uc = ((\pi^{2*}k_B^4) / (60\hbar^3c2)) * T^4$

Using j already includes the 1/4 angular factor, so the total radiated power is

$P = Aj = (\pi^2k_B^4 / (60^*\hbar^{3*}c^2)) * A * T^4$

Now substitute A and T into P

$T = \hbar c^3 / (8\pi k_BGM)$

$A = 4\pi Rs^2 = 16piG^2M^2 / c^4$

$P = (\hbar^6) / (15360\pi G^2M^2)$

Mass loss from energy conservation

The energy loss P = - dE/dt must equal the mass loss rate times c^2

$\Delta E = \Delta M * c^2$, $dE/dt = c^2 * (dM/dt)$

$c^2 * (dM/dt) = -P = - (\hbar * c^6) / (15360\pi G^2 * M^2)$

Hence $dM/dt = - (\hbar^4) / (15360\pi G^2 M^2)$

Rewrite in terms of the SET flux Q

$Q = 16\pi G^2 * M^2 / c^3$

$1/M^2 = (16\pi G^2) / (Q * c^3)$

Substituting gives us

$dM/dt = - (\hbar c / 960Q)$

Black Hole Heat Capacity

$C(Q) = – 8 \pi k_B G /(\hbar c) \cdot (Q c^3 / 16 \pi G^2)$

$C(Q) = – (k_B c^2 / (2 G \hbar)) \cdot Q.$

The result is the constant we derived earlier, which essentially is the rate at which we turn an isotropic energy density (u) into a net outward flux. Here we derived it again entirely from the SET Clausius relation (deltaQ = TdeltaS), horizon thermodynamics, and the single SET formula (boundary condition)

$Q = 4piRs^2c = 16\pi G^2 * M^2 / c^3$; $Rs = \sqrt{(Q/ 4\pi c)}$; Area = Q/c

SET predicts Hawking evaporation entirely from its own axioms and thermodynamics. The evaporation law could be a consequence of the flux of space.

Horizon entropy (consistency check, no new constant)

Take the standard horizon area entropy law

$S_\Sigma = (k_B c^3 / 4 G \hbar) \cdot A_{eff}$.

From Axiom 1 the flux through the same surface is

$Q = \oint S \cdot dA = \bar{S}_\Sigma \cdot A_{eff}$,

where $\bar{S}_\Sigma \equiv Q/A_{eff}$ is the area-mean speed on Σ.

Eliminate A_{eff}:

$Q = (4 G \hbar / k_B c^3) \cdot \bar{S}_\Sigma \cdot S_\Sigma$

$= (4 G \hbar / k_B c^2) \cdot (\bar{S}_\Sigma / c) \cdot S_\Sigma$.

On a horizon (Axiom 2: $|S| \to c \Rightarrow \bar{S}_\Sigma = c$) this reduces to the exact identity

$Q = (4 G \hbar / k_B c^2) \cdot S_\Sigma$

This equation links the volumetric space flux Q, from SET to black hole entropy S directly, through G, ħ, k_B, and c, constants

It fuses the Bekenstein Hawking entropy with your flux definition of space creation, meaning that the rate of space being emitted by a mass equals its thermodynamic information content.

This kind of one to one algebraic bridge is extremely rare. It shows that what SET calls the emanation rate of space encodes the thermodynamic information content. Where as GR imports several things to connect geometry to a thermodynamics. Quantum fields on a fixed curved background, statistical interpretation of the horizon area, and TransPlanckian continuation of quantum modes.

Entropy flux identification (interpretation, not a new axiom)

$s^\mu \equiv (k_B/\hbar) \cdot F^\mu \;\rightarrow\; \nabla_\mu s^\mu = (k_B/\hbar) \cdot \nabla_\mu F^\mu$

Plain meaning

F^μ is the flux 4-vector: $F^\mu = (V_{time}, S^i)$.

s^μ is defined as the entropy current carried by that flux: each unit of volume-flux (“sbit”) transports a fixed entropy, so entropy flow $\propto$ flux flow.

Taking a divergence preserves the proportionality:

In vacuum: ∇_μ F^μ = 0 ⇒ ∇_μ s^μ = 0 (entropy current conserved).

In matter: Axiom 1 gives ∇_μ F^μ = √(24πG)·n, so

∇_μ s^μ = (k_B/ħ)·√(24πG)·n,

which reads “rest-density n sources entropy flow at a fixed local rate” (sbits per unit proper volume per unit proper time).

The ratio k_B/ħ is the natural thermo-quantum converter that appears with Unruh/Hawking temperatures (δQ = T·δS on local Rindler patches). Using k_B/ħ ties that Clausius logic to the SET flux picture without introducing new dynamics or parameters.

This section is interpretive: it does not modify Axiom 1 (∇_μ F^μ = √(24πG)·n) or Axiom 2 (F_μF^μ = c²).

For exploration one may write s^μ = σ·F^μ and fix the single constant σ by horizon calibration; choosing σ = k_B/ħ matches the standard Unruh/Hawking normalizations.

Mass information ledger (SET, horizon bits)

Setup (Axioms 2–3). At a horizon |S|→c and the volumetric flux is Q = 4π R_s² c. We use the standard Hawking thermodynamics of a neutral, non rotating BH as the calibration target.

Setup (standard Hawking scalings at a Schwarzschild horizon):

Power (luminosity): L = (ħ c⁶) / (15360 π G² M²)

Temperature: T_H = (ħ c³) / (8 π G M k_B)

Hawking temperature in Q
T_H(Q) = (ħ / (4 * π * k_B)) * √(4 * π * c³ / Q)

Entropy: S_BH = (4 π k_B * G * M²) / (ħ c)

Entropy loss rate (using dM/dt = –L /c² and dS/dM = 8π k_B * G * M / (ħ c)):

dS_BH/dt = – k_B * c^3 / (1920 * G * M)

Bit cadence (one bit = k_B * ln 2 of entropy):
N_bits_dot = |dS_BH/dt| / (k_B * ln 2) = c^3 / (1920 * G * M * ln 2)

Per-bit energy (this is the key identity):
DeltaE_bit = L / N_bits_dot
= [($\hbar$ c^6) / (15360π * G^2 * M^2)] / [c^3 / (1920 * G * M * ln 2)]
= ($\hbar$ * c^3 / (8π * G * M)) * ln 2
= k_B * T_H * ln 2.

SET tie-in (expressed with R_s and Q).
With R_s = 2 G M / c^2 and Q = 4 pi R_s^2 c:

DeltaE_bit = ($\hbar$ c / (4π * Rs)) * ln 2 = k_B * T_H * ln 2

N_bits_dot = c / (960Rs * ln 2) = (1 / (960 * ln 2)) * sqrt((4π * c^3) / Q)

Each emitted “sbit” (one qubit) carries energy DeltaE_bit = k_B * T_H * ln 2.

The bit rate N_bits_dot times DeltaE_bit reproduces Hawking’s power L, so the energy and information ledgers match exactly at the horizon.

In SET language the outward space flux Q is implemented as a stream of sbits whose thermodynamic bookkeeping is consistent with Hawking/Unruh temperature and black hole entropy loss.

Cadence from the boundary law

The total space emanation flux is fixed by SET’s Axiom 3:
Q = 4piRs**2*c,

Since each sbit has a volume lp3 (for simplicity) the emission rate is
Ndot = Q / lp3 sbits/s.

Mass falls in the mass ledger. Because M = E/c**2, the loss rate is
dM/dt = - (hbarc)/(960Q),
while the exterior universe grows by the same Ndot Planck volumes each second.

Exterior volume gain:
Ndot * lp3 = Q (m3/s)

Horizon shrink rate (from the Hawking/SET match):

patches/s = |dA/dt| / lp2 = c / (240*Rs), so
dA/dt = - (lp2 * c) / (240*Rs)

With dA/dRs = 8piRs, the continuous radius change is
dRs/dt = - lp2 * c / (1920piRs2)

Lost interior volume
dV_BH/dt = 4piRs2*(dRs/dt) = - lp2*c / 480

Many sparks/sbits/volume precede one patch erasure, ratio ≈ 960pi(Rs3 / lp3).

In SET there are no ports. The event horizon emanates space from itself, and most of this space mixes with the surrounding field at the boundary. The “ports” interpretation is only a quantization of the horizon, a way to count how much of the horizon surface is lost per unit of emanated volume in black holes. It also serves as a convenient way to count Planck scale volumes as information bits, nothing more. The physical picture can remain continuous, the horizon emanates space smoothly, and quantization, for now, is just an accounting tool to track its shrink rate or information content.

Entropy and information

Each sbit erases a tiny sliver of horizon area
$\Delta A = lp^2 / [960\ \pi\ (Rs/lp)^3]$ per sbit,
reducing BH entropy by
$\Delta S_BH = k_B / [3840\ \pi\ (Rs/lp)^3]$ per sbit.
After $960\ \pi\ (Rs/lp)^3$ sbits, one Planck patch (lp^2) is gone, which carries k_B/4 of entropy.
To remove/export one information bit (k_B ln 2) requires $(4 \ln 2) \cdot 960\ \pi\ (Rs/lp)^3$ sbits in total.

The same k_B ln 2 then appears outside in the radiation’s microstate count (on average, spread over that many sbits). Microscopic (unitary) entropy is conserved, coarse grained entropy (BH + radiation) still increases, satisfying the generalized second law.

Expansion raises entropy.

Every unit of volume created by the flux opens new places and configurations for energy. Degrees of freedom increase. The density can drop as the universe expands, but the number of possible arrangements grows faster. S increases even at fixed total energy. The same energy now occupies a larger configuration space; nothing new is created, we just have more ways to arrange what's already there.

Local vs global.
Locally, matter radiates and equilibrates its surrounding flux (microscopic entropy). Globally, the cumulative expansion of Qtotal increases the available microstates for all energy (macroscopic entropy). If mass emanates space, the rise of entropy is not optional, it's the natural outcome.

Core SET:
Horizon entropy in SET variables:
$S_{horizon} = (k_B A) / (4 L_p^2) = (k_B c^2 / 4 \hbar G) \cdot Q$.
Entropy production rate at a horizon:
$dS_{horizon}/dt = (k_B c^2 / 4 \hbar G) \cdot dQ/dt$.
Space energy balance (SET form):
$dE_{space} = T\, dS - P\, dV$, with $S \propto Q$ and $\dot{V} \sim H V$ for the background.
Generalized second law (SET):
$d/dt [S_{outside} + (k_B c^2 / 4 \hbar G) \cdot Q] \geq 0$.
Tolman Ehrenfest (static equilibrium):
$T_{loc}(x) \cdot \alpha(x) = \text{const}$.

SET Mandelstan Quantum speed limit at the horizon (pondering)

$\tau_{QSL}(Q) = 2 \pi^2 \sqrt{(Q / 4\pi c)} / c$

This expresses the fastest distinguishable transition a horizon can undergo given its flux Q.

It's the quantum speed limit cast in SET variables, linking the rate of state change to the same flux that drives space creation. Real emission cadences remain far above this bound, so the limit is satisfied and offers a bridge between SET's continuous flux and quantum discreteness. SET's continuous flow of space seems compatible with quantum mechanics rule about how quickly a system can evolve.

Instantaneous power and cadence (SET ↔ Hawking)

Setup (Axioms 2–3): at a horizon $|S| \to c$ and the volumetric flux is $Q = 4\pi R_s^2 c$. Use the standard Hawking temperature $T_H = \hbar c^3/(8\pi G M k_B)$.

Per-sbit energy (mean):
$\Delta E = P/\dot{N} = (\hbar c l_p^3)/(15360 \pi^2 Rs^4)$.

Emission cadence (sbits per second):
$\dot{N} = Q/l_p^3 = 4\pi Rs^2 c / l_p^3$.

Power:
$P = \Delta E \times \dot{N}$
$= [(\hbar c l_p^3)/(15360 \pi^2 R_s^4)] \times [4\pi Rs^2 c / l_p^3]$
$= \hbar c^2 /(3840 \pi Rs^2)$
$= \hbar c^6 /(15360 \pi G^2 M^2)$. (matches Hawking's Schwarzschild luminosity)

Mass loss (ledger form):
$dM/dt = - P/c^2 = - \hbar c /(960 Q)$.

Horizon shrink:
patches/s $= |dA/dt|/l_p^2 = c/(240 Rs)$,
so $dA/dt = - l_p^2 c /(240 R_s)$ and, using $dA/dR_s = 8\pi Rs$,
$dR_s/dt = - l_p^2 c /(1920 \pi Rs^2)$.

Many sbits precede one patch erasure:
$N_{sbits\ per\ l_p^2} = 960 \pi (Rs/l_p)^3$.

Entropy and information (Page curve)

Per sbit area erasure:
$\Delta A_{per\ sbit} = l_p^2 / [960 \pi (Rs/l_p)^3]$.

Per-sbit BH entropy loss ($S = (k_B c^3/4G\hbar)A \to k_B/4$ per l_p^2):
$\Delta S_{BH,\ per\ sbit} = (k_B/4) \times (\Delta A_{per\ sbit}/l_p^2)$
$= k_B / [3840 \pi (R_s/l_p)^3]$.

One information bit ($k_B \ln 2$) corresponds to area $4 \ln 2 \times l_p^2$, so the number of sbits per bit is:
$N_{sbits\ per\ bit} = (4 \ln 2) \times 960 \pi (R_s/l_p)^3$.

Average energy per bit (from power/bit rate) comes out to Landauer at the Hawking temperature:
$\Delta E_{bit} = P / (\dot{N}_{bit}) = k_B T_H \ln 2$

$= [\hbar c^6 / (15360 \pi G^2 M^2)] / [c^3/(1920 G M \ln 2)]$
$= (\hbar c^3 / (8\pi G M)) \ln 2.$

Radiation entanglement entropy (idealized Page curve with N_0 total bits initially available):
S_rad(n) = k_B ln 2 · min(n, N_0 – n),
so entropy rises to the Page time (n ≈ N_0/2) and then falls back to zero as evaporation completes.

Deriving the 240/c factor.

Start with Hawking's mass loss law

$dM/dt = – \hbar c^4 / (15360 \pi G^2 M^2)$

Write M in terms of the horizon radius

Schwarzschild relation
$M = (c^2 R_s) / (2 G)$
$M^2 = (c^4 R_s^2) / (4 G^2)$

Express the mass-loss rate in R_s form
Plug M^2 into step 1:
$dM/dt = – \hbar c^4 / (15360 \pi G^2) \times [4 G^2 / (c^4 R_s^2)] = – \hbar / (3840 \pi R_s^2)$

Relate radius change to mass change
From $M = (c^2 R_s)/(2 G)$ we have
$dM/dt = (c^2 / 2 G) \cdot dR_s/dt$
$dR_s/dt = (2 G / c^2) \cdot dM/dt = – \hbar G / (1920 \pi c^2 R_s^2)$

Convert radius shrink to area shrink
Horizon area $A = 4 \pi R_s^2$ so $dA/dR_s = 8 \pi R_s$
$dA/dt = 8 \pi R_s \cdot dR_s/dt = 8 \pi R_s \times [– \hbar G / (1920 \pi c^2 R_s^2)] = – \hbar G / (240 c^2 R_s)$

Insert the Planck area
Planck patch $\ell_p^2 \equiv \hbar G / c^3$
Therefore $dA/dt = – \ell_p^2 c / (240 R_s)$ →(area loss)

The cadence
Patch removal rate $|dA/dt| / \ell_p^2 = c / (240 R_s)$

At a Schwarzschild horizon the energy ledger is

$\delta E = (\kappa/8\pi G)\cdot\delta A + \mu_s\cdot\delta N_s$,

with $\kappa = c^4/(4GM) = c^2/(2R_s)$, $A = 4\pi R_s^2$, $N_s = V/\ell_p^3$,

$\mu_s \equiv \varepsilon_V \ell_p^3 = (\hbar c^3/(960\, Q^2))\cdot \ell_p^3$, and $Q = 4\pi R_s^2\, c$.

($\ell_p^2 = \hbar G/c^3$, $\ell_p^3 = \ell_p^2\cdot\ell_p$.)

Power: with $\dot{N}_s = dN_s/dt = Q/\ell_p^3$,

$P_s = \mu_s \dot{N}_s = \varepsilon_V Q = \hbar c^3/(960\, Q)$.

Adding the area channel reproduces the Hawking luminosity

$P = \hbar c^6/(15360\, \pi\, G^2 M^2)$.

Evaporation law: $dE/dt = -P$ and $E = Mc^2$ give

$dM/dt = -P/c^2 = -\hbar c/(960\, Q)$ (SET–Hawking identity).

Entropy flow: with $S_{BH} = (k_B c^3/4G\hbar)A$ and $T_H = \hbar\kappa/(2\pi k_B c)$,

$\delta E = T_H\, \delta S_{BH} + \mu_s\, \delta N_s$ (Clausius + sbit work, no extra constants).

Stretched horizon: for any Σ with $|S| \lesssim c$, $Q(\Sigma) = \oint_\Sigma S\cdot dA$, capacity $Q_{set}(\Sigma)=A_{eff}\, c$.

As $\Sigma \to$ horizon, $Q(\Sigma)\to Q$. The same first law, holds with $\mu_s(\Sigma) = (\hbar c^3/(960\, Q(\Sigma)^2))\cdot \ell_p^3$.

Volumetric equivalent: $\delta E = (\kappa/8\pi G)\cdot\delta A + \varepsilon_V\, \delta V$, with $\varepsilon_V = \hbar c^3/(960\, Q^2)$.

Causal Mixing Law (exploratory, not an axiom)

In the first versions of this work, I used the emitting surface as tiled by Planck-area “ports,” each releasing one quantum of space per Planck time. The image was helpful, so I kept it for convenience of having a temporary interpretation of holographic principles, just to address it later with my original intuition. Space doesn’t need ports. All it needs is time.

When a mass emanates space, the new volume cannot instantly merge with the old one. Instantaneous interaction would violate causality. Every existing layer of space must mix with the next at a finite rate, limited by the universal constant c. We do not need discrete ports. I

now picture a causal mixing, a spherical shell that expands only as fast as the old and new layers of space can blend.

The causal mixing picture

Imagine a thin spherical layer of radius R, surface area $4\pi R^2$, surrounding a mass M. Inside, new space is continuously emanated at a rate Q (in m^3/s). To accommodate this new space, the existing shell must move outward, merging with the new volume beneath it. This mixing occurs locally at c; what limits the total throughput is the production Q and the surface capacity A_eff·c. Why mixing at all? As the old spherical shell moves outward into an ever larger radius, it must grow to keep enclosing the interior. That growth comes from assimilating/adding part of the newly emanated volume pushing from beneath, and causality mandates this assimilation takes finite time.

The supply speed per unit area is
$S_{sup} = Q / A_{eff}$,

and the observed assimilation speed per area is the causal clip
$S_{obs} = \min(S_{sup}, c)$.

The observed volumetric throughput across the surface is therefore
$Q_{obs} = A_{eff} \cdot S_{obs} = \min(Q, A_{eff} \cdot c)$.

If $Q < A_{eff} \cdot c$, the shell keeps up freely. If $Q \to A_{eff} \cdot c$, every patch of the surface becomes fully engaged—the causal limit. At that point, the process saturates, and we recover the horizon condition:
$Q = A_{eff} \cdot c$.

This condition defines the boundary beyond which new space can no longer be assimilated faster than c. The same boundary later manifests as a black-hole horizon or the saturation of gravitational potential in SET.

The inverse-square law as geometric dilution

As the flux Q spreads outward, it must be shared among larger shells. Because $A_{eff} \propto R^2$, the local flow speed per area dilutes as
$S(R) = Q / A_{eff}(R) \propto 1/R^2$.

This simple geometric dilution is the natural origin of the inverse square law in SET. Gravity appears to weaken with distance not because it fades, but because the same volumetric emission is distributed over an ever-growing surface of space.

Finite time mixing and causality

Nothing in the universe updates instantly. Even the merging of space itself requires a finite interval. If the source flux Q(t) changes in time, the assimilation responds with a small causal delay governed by
$\tau_{mix} \cdot dS_{obs}/dt + S_{obs} = \min(Q/A_{eff}, c)$,

where $\tau_{mix} \approx \ell_p / c$ is the microscopic delay between successive assimilations of space. Though vanishingly small, this delay ensures that space creation always respects causality. It also means the gravitational field cannot jump discontinuously, it must relax smoothly at the speed of information.

Reconnection with SET's flux law

At steady state, $S_{obs} = S_{sup}$, and therefore
$Q = A_{eff} \cdot S(R)$.

Using $S(R) = \sqrt{(2GM/R)}$ from Axiom 3, we obtain
$Q = 4\pi R^2 \sqrt{(2GM/R)}$,

and at the horizon $S \to c \to Q = A_{eff} \cdot c$. Thus, the causal mixing model reproduces the full SET flux law directly, but now without any reference to discrete ports, only causality and geometry.

Energy and information at the causal limit

At the causal limit, every square meter of the surface integrates new space at the maximum possible rate c. This is the horizon capacity, the point where geometry, causality, and thermodynamics coincide. The energy per unit new volume remains tied to Hawking's law through the relation
$dM/dt = -(\hbar c)/(960\, Q)$,

and at $Q = A_{eff} \cdot c$, this scaling matches the Hawking power and information rate. SET thus unifies black hole radiation, space creation, and mass loss under the same causal rule.

Micro Macro Continuity

Planck scales causal mixing front in domains of size ℓ_p, each updating once per Planck time $t_p = \ell_p / c$, although discretization of space and time are used the whole interpretation holds without it, it is a convenience to visualize local mixing speed. All interpretations remain the same, under an space continuum. The local volumetric cadence per area is therefore $\ell_p / t_p = c$, the same constant that limits every process in nature. A macroscopic surface of area A_{eff} contains
$N = A_{eff}/\ell_p^2$
independent microscopic regions, each blending old and new space stochastically within the causal envelope. Their combined activity yields a net flux Q with a statistical variance
$\sigma_Q / Q \approx 1/\sqrt{N} = \ell_p / \sqrt{A_{eff}}$.

Energy/Information Bookkeeping at the Horizon (calibration, not a postulate)

Hawking "photon bit".
$T_H = \hbar c^3 / (8\pi G k_B M)$.
Energy per Shannon bit:
$\Delta E_{bit} = k_B T_H \ln 2 = (\hbar c^3 / (8\pi G M)) \ln 2$.

Sbit (Planck-volume quantum).
At a horizon the causal mixing saturates everywhere: $Q = 4\pi R_s^2 c$.
Sbit rate: $\dot{N} = Q / \ell_p^3 = 4\pi R_s^2 c / \ell_p^3$.

Hawking power.
$P = \hbar c^2 / (3840\, \pi R_s^2) = \hbar c^6 / (15360\, \pi G^2 M^2)$.

Energy per sbit (not constant).
$\Delta E_{sbit} = P / \dot{N} = [\hbar c \ell_p^3] / [15360\, \pi^2 R_s^4]$.

Compatibility note (mixing, not ports).
All of the above follows naturally from the capacity condition at the horizon, local mixing at c, everywhere engaged. The sbit is only a unit of bookkeeping, a Planck volume of space created per causal tick. Its energy comes from dividing the Hawking power by the volumetric creation rate $Q = 4\pi R_s^2 c$. A_{eff} is the effective readout area of the horizon surface (for a Schwarzschild black hole, $A = 4\pi R_s^2$).

Entropy and bits, same stream, two languages.
Entropy flow at the horizon is simply power over temperature, P / T_H, or in information terms $k_B \ln 2$ times the bit rate. Numerically,
$dS_{rad}/dt = k_B c^3 / (1920 G M)$.
The energy channel and the information channel are the same physical current, just read in different units.

Area shrink from the same capacity law.
SET's mass loss identity with $Q = A c$ gives $dM/dt = -\hbar / (960 A)$. With $A = 16\pi G^2 M^2 / c^4$, this becomes
$dA/dt = -\hbar / (480 M)$.
The area contracts at a universal pace set by $\hbar$ and $1/M$, nothing else.

Consistency check.
Using $S_{BH} = k_B c^3 A / (4 G \hbar)$, the above rate yields
$dS_{BH}/dt = -k_B c^3 / (1920 G M)$,
which exactly equals $-P/T_H$. Energy loss, entropy decrease, and geometric contraction turn out to be the same event described in three languages. Hawking power, horizon capacity, and the area–entropy law are not separate ideas; they are one identity once written in causal-mixing terms.

At capacity ($Q = A c$) the horizon is fully engaged; every square meter of area integrates new space at the limit speed c. Energy, area, and entropy flow together in perfect harmony. This is the simplest possible picture of a black hole, no ports, no curvature machinery, just the causal surface of space itself, updating at the fastest rate the universe allows.

The reasoning behind this interpretation of SET comes from merging interpretations that are already justify algebraically and empirically observed. So for example, we know information and events regarding space whether it be curvature, or expansion(in SET), travel at the speed of light. In SET, I feel confident that gravity is real and that it comes from expansion. And we know a physically conserved, expanding volume from the emanation mechanism would inevitably need mixing(outer shells cannot just stretch into their new size, breaks conservation). This mixing cant happen in zero time. There is a delay. c is the delay. Although it is the max speed, it keeps the universe causal and non instantaneous.

In SET space does not stretch everywhere at once it mixes forward, shell by shell, respecting causality. The universe does not skip frames. It builds them, one causal tick at a time.
Q is the conserved volumetric flux. If Q is conserved, as it moves outward it cannot expand, to cover a larger area it must mix with newly emanated volume. Because mixing must occur, it must take time, it cannot be instantaneous nor faster than light. Then $Q = A_{eff} \cdot c$ is not an assumption but an inevitable consequence of a conserved flux. The mixing requirement born from conservation makes the horizon inevitable, the moment when emanated space and its boundary/already existing previously emanated space meet if the outward speed of emanation reaches c, it meets at that point the mixing speed. The boundary is overwhelmed/capped. An

event horizon is formed.

Mixing pressure

The conserved flux assigns an energy cost to volume creation. From the SET–Hawking identity,

$dM/dt = -(\hbar c) / (960 Q)$.

Convert to an energy rate:
$dE/dt = c^2 dM/dt = -(\hbar c^3) / (960 Q)$.

Mixing pressure is the energetic cost per unit volume of assimilating new space at flux Q:

$P_{mix} \equiv dE/dV = (dE/dt) / (dV/dt)$

$P_{mix} = [(\hbar c^3)/(960 Q)] / Q = (J/s) / (m^3/s)$

$P_{mix} \equiv dE/dV = (\hbar c^3) / (960 Q^2) = J/m^3 = Pa$

This is the counter pressure the surface must supply to assimilate new space while staying causal. If density rises, Q falls and P_mix increases, the boundary pushes back harder. At capacity, $Q = A_{eff} \cdot c$ and, for a Schwarzschild sphere,

$P_{mix} = \hbar c / (15360 \pi^2 R_s^4)$,

a clean $\hbar c / R^4$ law that mirrors the scaling of Casimir pressure (different factor, different origin). Geometry enters through A_eff, so stress is anisotropic where the surface is elongated or pinched.

Pump vs surface

Define the pump (mixing) pressure directly from Q:

$P_{pump}(Q) = \hbar \cdot c^3 / (960 \cdot Q^2)$.

Uniform mass density form (using $Q^2 = (24\pi G) \cdot M^2/\rho$):

$P_{pump}(M,\rho) = (\hbar \cdot c^3 / (23040 \cdot \pi \cdot G)) \cdot (\rho / M^2)$.

Define the purely geometric surface capacity pressure scale:

$P_{surf}(A_{eff}) = \hbar \cdot c / (960 \cdot A_{eff}^2)$.

Causality gives $Q \le A_{eff} \cdot c$. Therefore,

$1/Q^2 \ge 1/(A_{eff}^2 \cdot c^2)$
$\rightarrow P_{pump}(Q) \ge \hbar \cdot c^3 / [960 \cdot (A_{eff}^2 \cdot c^2)] = \hbar \cdot c / (960 \cdot A_{eff}^2) = P_{surf}(A_{eff})$,

Conservation (Q), concavity ($\sqrt{\rho}$), and geometry (A_eff) together could explain why packing mass denser [at fixed M] raises the mixing pressure and lowers total throughput.

$Q \le A_{eff} \cdot c \Rightarrow 1/Q^2 \ge 1/(A_{eff}^2 \cdot c^2)$. Therefore
$P_{mix}(Q) \ge \hbar \cdot c / (960 \cdot A_{eff}^2) \equiv P_{surf}(A_{eff})$,

with equality only at capacity (horizon)
$P_{mix} / P_{surf} = (A_{eff} \cdot c / Q)^2 \geq 1$

In SET the only outward current is the space flux Q, but a black hole still, it seems, radiates. The radiation is not stuff escaping from inside; it is the tiny energy/entropy current that is generated at the horizon because the causal mixing has a finite energetic cost.

$Q = A \cdot c$ ($A = 4\pi \cdot R_s^2$ for Schwarzschild).
Mixing work per unit volume: $P_{mix} = \hbar \cdot c^3 / (960 \cdot Q^2)$.

Power required to assimilate new space at rate Q:
$P_{out} = P_{mix} \cdot (dV/dt) = (\hbar \cdot c^3 / (960 \cdot Q^2)) \cdot Q = \hbar \cdot c^3 / (960 \cdot Q)$.

With $Q = A \cdot c$ this gives
$P_{out} = \hbar \cdot c^2 / (960 \cdot A) = \hbar \cdot c^2 / (3840 \cdot \pi \cdot R_s^2)$,

which is exactly the standard Hawking power. Energy conservation then,
$dE/dt = -P_{out}$ and $dM/dt = -P_{out} / c^2 = -\hbar \cdot c / (960 \cdot Q)$,

The radiation may be a byproduct of capacity-limited mixing, the boundary must pay P_{mix} per cubic meter to fold the new volume in causally. That work appears as a faint outward energy/entropy current (Hawking like) created just outside the horizon. Nothing escapes from the interior. BH's may radiate in SET, at the Hawking rate. The radiation may be the mixing at c cost. Mixing at c surpasses a threshold, is not ordinary mixing. Under this condition a clear in/non escapable and out is drawn. Many new physics phenomena emerge. One of them, a radiative boundary.

In SET the flux carries a system's state outward, but a black hole never lets interior signals cross the horizon. What escapes is not stuff from inside, it's the boundary itself talking. At capacity ($Q=A \cdot c$) the horizon mixes at c and must pay the mixing cost, that creates a tiny outward energy/entropy current (Hawkingvlike) and encodes the only data the exterior can ever read: A_{eff} and its evolution, ringdown, accretion, spin, nothing else. Interior dynamics influence the outside only insofar as they back react on the boundary. Causality is never violated, the boundary is the message.

Short, energy conservation Black Hole

At capacity (horizon), the flux must mix at the causal rate, carrying with it a finite energetic cost per volume
$P_{mix} = \hbar c^3 / (960 Q^2)$.
Since $dV/dt = Q$ at the boundary, the power is
$P_{out} = P_{mix} \times Q = \hbar c^3 / (960 Q)$.

Mass loss equals radiated power over c^2:
$dM/dt = -P_{out} / c^2 = -\hbar c / (960 Q)$.
This is exactly the SET–Hawking constant. No negative energy is needed; the energy comes from the mixing work the saturated boundary performs.

Consistency with the Hawking value:
For a black hole $Q = A \times c = 4\pi R_s^2 \times c$ or $Q = 16\pi G^2 M^2 / c^3$
Plugging into Pout reproduces the standard Hawking luminosity.

The entire energy ledger is close with one rule, mixing at capacity costs energy, and that energy exits as radiation.

We define k for short,

Start with the SET lapse (from Axiom 2 plus the spherical escape speed driver
$\alpha(r) = \sqrt{(1 - R_s/r)}$ where $R_s = 2GM/c^2$.
SET defines the static hover acceleration via the proper radial gradient of the lapse:
$g(r) = c^2 \cdot d(\ln \alpha)/d\ell$, with $d\ell = dr/\alpha$.
Differentiate:
$d(\ln \alpha)/dr = (1/2) \cdot [(R_s/r^2) / (1 - R_s/r)]$.
Convert to proper distance using $d/d\ell = \alpha \cdot d/dr$:
$d(\ln \alpha)/d\ell = \alpha \cdot d(\ln \alpha)/dr = \sqrt{(1 - R_s/r)} \cdot (R_s / [2 r^2 (1 - R_s/r)]) = R_s / [2 r^2 \sqrt{(1 - R_s/r)}]$.
Therefore
$g(r) = c^2 \cdot R_s / [2 r^2 \sqrt{(1 - R_s/r)}]$.
Surface gravity is the redshifted hover acceleration at the horizon
$\kappa \equiv \lim_{r \to R_s} \alpha \cdot g(r)$.
Multiply by $\alpha = \sqrt{(1 - R_s/r)}$ and take $r \to Rs$:
$\kappa = c^2 \cdot R_s / (2 r^2) |_{r=R_s} = c^2 / (2 R_s)$.
Using $R_s = 2GM/c^2$:
$\kappa = c^4 / (4GM)$

$Q = A c$.
The per sbit mixing cost
$\mu s \equiv \hbar c / (960 Q)$.
Horizon area entropy and temperature standard,
$S = (k_B c^3 / 4 G \hbar) A$,
$T_H = \hbar \kappa / (2\pi k_B c)$, with $\kappa = c^2/(2 R_s)$.
Familiar area channel,
$T_H dS = (\kappa / 8\pi G) dA$.

Split the total energy change
Energy carried out per dt has:
an area/heat piece: $T_H dS = (\kappa/8\pi G) dA$,
work to mint new space, $\mu s dN_s$, dN_s is the number of Planck volume sbits created ($dN_s = dV/\ell_p^3 = Q dt/\ell_p^3$).

Divide by c^2 to write it as mass change,
$\delta M = (\kappa / 8\pi G) \delta A + \mu s \delta N_s$.

Such that, $dN_s = dV/\ell_p^3$ and $\mu s = \hbar c /(960 Q)$,

the second term is the volumetric mixing cost
$\varepsilon_V dV$ with $\varepsilon_V = \hbar c^3 /(960 Q^2)$,
so Q=ac thermodynamics version is,
$\delta M = (\kappa / 8\pi G) \delta A + \varepsilon_V \delta V$.

Short, Thermodynamic closure

Horizon entropy and temperature:
$S = (kB c^3 / 4G\hbar) \times A$
$TH = (\hbar\kappa) / (2\pi kB c)$ with $\kappa = c^2 / (2Rs)$

SET's Qc in SET's thermodynamic language, no curvature:
δM = (κ / 8πG) δA + μs δNs , Replace k and Rs, **δM = [c^(5/2) / (8 G √(πQ))] δA + μs δNs**
μs = ħc / (960Q)
Ṅs = Q / ℓp³

In SET's capacity plus mixing cost, no curvature. SET compresses power, entropy flow, information rate, area shrink, and bit cadence into one statement, and still reproduces the standard GR/Hawking numbers. This shocked me, because through SET I got black hole thermodynamics, from a curvature story into a more consistent conservation/throughput story.

A Quantum picture of time dilation in SET (exploratory)

In SET, the mass driven flux carries the information about a mass's state. Two things cause time dilation here: motion (v) and ambient outflow (S). If you think of time as a series of events, not a smooth continuum, the picture gains nuance. The setup becomes, how many events per kg can the flux carry? If the boundary (R) at the separatrix is fixed and we increase mass density, flux per kg goes down. Your time then becomes how many of your immediate emanated shells update/mix with the ambient shell per kg per Planck second.

Under this picture, because shells mix at the speed of light, trying to raise the effective space speed S to c simply hits a capacity cap. Likewise, increasing your speed v against a constant flux also hits the same events update cap. Your immediate shell (the separatrix that contains you) must mix against the ambient flow, and a higher through space turnover spends more of the same causal budget.

Each mixture event acts as a stitch that embroiders events into reality. Each "stitch" is one tiny mixing event where your newly emanated shell blends with the ambient shell across your surface. I'll call the microscopic mixing cell size ℓ_c^3. ℓ_c is just a convenient micro length (Planck if you like); it cancels in the ratios, so no result hinges on its exact value. How many stitches you can complete per kg per second is your clock.

Flux and surface. A mass M drives a conserved volumetric flux Q. Outside, the local space speed per area is S = Q / A_eff. The surface that actually does the stitching is the effective contact area A_eff of your immediate thin shell (the separatrix). (For a spherical readout, A_eff = $4\pi R^2$ and S(R) = √(2GM/R), matching Axiom 3.)

Causal capacity. No patch of surface can mix faster than c. If each stitch sweeps one ℓ_c^3 cell, the absolute stitching capacity is
C = (A_eff · c) / ℓ_c^3 [stitches/s].
Units sanity: (area × speed) / volume = 1/s.

Per kg ceiling at rest. With nothing else demanding capacity, the ceiling of stitched events per kg per second is
F1 = C / M = (A_eff · c) / (ℓ_c^3 · M) [stitches/(s·kg)].
This 1/M is not "time dilation"; it's just the raw capacity per kg if you were at rest in empty space.

What actually dilates the clock

Two things spend that finite capacity before you can use it to update your own state:

Motion through space. Moving at speed v (relative to the local rest frame) forces your surface to assimilate ambient space across A_eff at rate v:
$L_v = (A_{eff} \cdot v) / \ell_{c^3}$ [stitches/s].

Ambient outflow"S" (gravity in SET). Even at rest, ambient space is already flowing outward at $S = Q / A_{eff}$, which your shell must also assimilate:
$L_S = (A_{eff} \cdot S) / \ell_{c^3}$ [stitches/s].

Causal split (the budget).
Two orthogonal demands share one causal cap. The clean, isotropic way to encode that is the same Pythagorean logic behind $c^2 = v_{space}^2 + v_{time}^2$:
$C^2 = (L_v^2 + L_S^2) + (\dot{N})^2$,
where $\dot{N}$ is the stitch rate left for updating. Solve and normalize by C:
$\dot{N} / C = \sqrt{1 - (v/c)^2} \cdot \sqrt{1 - (S/c)^2}$.

That ratio is proper time rate:
$d\tau/dt = \sqrt{1 - (v/c)^2} \cdot \sqrt{1 - (S/c)^2}$.
The Lorentz factor fell out of counting stitches.
Per kg events rate,

Events per kg per second:
$\gamma \equiv (\text{dot } N)/M = [(A_{eff} \cdot c)/(\ell_{c^3} \cdot M)] \cdot \sqrt{1 - (v/c)^2} \cdot \sqrt{1 - (S/c)^2}$.
Relative to the empty, at rest ceiling F1, the only reduction is exactly that dilation factor. In this picture, time is simply how many stitches per kg you can complete.
More kgs under the fix boundary(increase density) need more stitches so the package update takes longer.

If we want an absolute "tick" count per Planck second, we use the Planck frequency $f_p = 1/t_p$ and write the per cell tick rate
$\text{tick_rate_cell} = f_p \cdot \sqrt{1 - (S/c)^2} \cdot \sqrt{1 - (v/c)^2}$,
with $S = Q / A_{eff}$. The total tick rate is then
$\text{dot } N = C \cdot \sqrt{1 - (S/c)^2} \cdot \sqrt{1 - (v/c)^2}$.
At capacity ($Q = A_{eff} \cdot c$), the time channel closes/stitches per second at max on that surface.

Newly emanated space doesn't merge instantly. It mixes with the existing boundary shell at a finite, causal rate of the speed of light. Each completed mix is a stitch, one discrete update of reality.

SET Smarr

Given,

$T = \hbar \kappa / (2\pi k_B c)$
$S = (k_B c^3 / 4G\hbar) A$

Schwarzschild: $M c^2 = 2 T S$.

$2 T S = 2 \times [\hbar \kappa / (2\pi k_B c)] \times [(k_B c^3 / 4G\hbar) A]$

$2 T S = (\kappa A c^2) / (4\pi G)$, classical

SET capacity: $Q = A c \rightarrow A = Q / c$

$(\kappa A c^2) / (4\pi G) \rightarrow (\kappa (Q/c) c^2) / (4\pi G) = (\kappa Q c) / (4\pi G)$

$2 T S = (\kappa A c^2)/(4\pi G) =$ **$(\kappa Q c)/(4\pi G)$**

$M c^2 = (\kappa Q c)/(4\pi G) + 2 \Omega J$

In SET this is the black hole's mass energy, equivalently 2TS. It says the energy of the hole equals (how hard the boundary pushes) × (how much space it must process per second), scaled by a universal gravitational factor.

Unitary Evaporation and the SET Page Curve

In SET, a black hole's energy is the work required to maintain a causal surface at capacity, $Q = 4\pi Rs^2 c$, where $Rs = 2GM/c^2$.
The emission of space from this saturated boundary defines its thermodynamic loss.
The flux law

$dM/dt = -\hbar c / (960 Q)$

describes the conversion of boundary flux into radiant space. Combined with the capacity condition, the relation is

$dM/dt = -K / M^2$, where $K = \hbar c^4 / (15360 \pi G^2)$.

This constant K governs both the power and lifetime of the evaporating source.

The instantaneous horizon entropy follows the flux derived expression

$S_{BH} = (k_B c^3 / 4 G\hbar) A = (4\pi k_B G / \hbar c) M^2$,

while the entropy exported through the causal channel (radiation) accumulates as

$S_{emit}(t) = (k_B c^3 / 3840 G K) [M_0^2 - M(t)^2]$.

Since $K = \hbar c^4 / (15360 \pi G^2)$, the coefficients match,

$S_{emit}(t) = (4\pi k_B G / \hbar c) [M_0^2 - M(t)^2]$.

Hence,

$S_{emit}(t) + S_{BH}(t) = (4\pi k_B G / \hbar c) M_0^2 = \text{const.}$

the rate of change of the emitted entropy equals the negative of the black hole's entropy change, both tied by the power temperature ratio
$dS_{emit}/dt = - dS_{BH}/dt = P / T_H$.
This means the radiation's entropy growth rate is the black hole's entropy loss rate. The Page curve we observe is the visible half of what seems a balanced conservation law.

The ledger closes, every sbit of boundary entropy lost is carried away as emitted information. No curvature or dual geometry, unitarity is preserved by the conservation of causal capacity.

To extract the coarse grained radiation entropy perceived externally and to avoid looking at every hidden internal configurations, keeping only the averaged, thermodynamic description, we apply the unitarity condition

$S_{rad}(t) = \min[S_{emit}(t), S_{BH}(t)]$.

At early times, the radiation entropy rises linearly with the outflow (S_{emit}).
When the remaining boundary entropy equals the radiated portion—

$S_{emit} = S_{BH}$

the black hole has reached the Page transition.
From $S_{BH} \propto M^2$, this occurs when $M = M_0 / \sqrt{2}$, leading to

$t_{Page} = (1 - 1 / (2\sqrt{2})) t_{evap} \approx 0.65 t_{evap}$,

where $t_{evap} = M_0^3 / (3K)$ is the total lifetime derived from the same flux law.

SET replaces the geometric island of holographic treatments with a mechanical reality,
the horizon is a causal mixer that exports information at a rate fixed by its capacity Q and its surface gravity κ.
The relation

$M c^2 = (\kappa Q c) / (4\pi G)$

expresses this equilibrium between boundary tension and volumetric throughput.
During evaporation, the boundary remains near capacity, and the energy cost of mixing space at $P_{mix} = \hbar c^3 / (960 Q^2)$ naturally yields the Hawking flux.
Because each sbit is conserved, the entropies of the hole and its radiation are exact complements.
The Page curve thus arises not from geometric extremization, but from flux balance in a unitary causal channel.

SET's picture of black hole evaporation is therefore self contained and unitary.
Space emission replaces information loss, and the causal boundary, running at capacity, keeps perfect thermodynamic accounting.

I feel the boundary/and the universe doesn't just store information, memory= area encoded state (via $S \propto A$), and updates it, processor= causal mixing at rate c. The balance law $M c^2 = (\kappa Q c)/(4\pi G)$ makes this explicit, surface gravity sets the tension, Q sets the throughput, and their product gives the ongoing processing energy. In short, SET turns the holographic area into a live device, the state is on the area, the dynamics is the mixing at c, for black holes.

Expansion from the SET Energy Law

This section treats capacity surfaces, black hole and cosmological horizons, where the boundary runs at full causal load, $Q = A c$. Ordinary masses like stars or planets are sub capacity systems, $Q \ll A c$. Their local entropy production is dominated by radiative and chemical processes rather than by space mixing work. The exploration below therefore describes the extreme case, event horizons that define the upper

thermodynamic limit of SET, not everyday matter, where the flux still participates but is accompanied by other processes. In the black hole scenario, the only mechanism that manifests beyond the event horizon is the mixing process at the boundary and the associated flux.

In SET, the total energy of any bounded system arises from the mechanical product of its boundary tension and volumetric throughput.

The fundamental relation

$$E = (\kappa Q c) / (4\pi G)$$

states that energy equals surface gravity (κ) times the causal capacity (Q), scaled by the gravitational constant.

This replaces curvature energy with flux expansion.

Taking the differential form,

$$dE = (c / 4\pi G) (\kappa dQ + Q d\kappa),$$

we read this as tension × throughput, a flux law for how energy changes as the boundary's capacity/tension evolves.

Hubble Patch Coarse Graining

At cosmic scale, the natural boundary is the Hubble horizon

$$R = c / H,$$

where H is the local expansion rate. The quantities are

$$\kappa \approx c^2 / R = c H,$$

$$A = 4\pi R^2,$$

$$Q = A c = 4\pi c^3 / H^2,$$

$$V = (4/3) \pi R^3.$$

Substituting into the energy law and taking the symmetric normalization,

$$E_{patch} = (\kappa A c^2) / (8\pi G),$$

yields the energy density of the cosmic causal engine,

$$\rho_{mix} = E_{patch} / V = 3 H^2 / (8\pi G).$$

This is the critical density, but here it emerges not from curvature balancing, rather from the boundary's mechanical output.

Expansion Work

The same causal flux that powers black hole evaporation now drives cosmic expansion.

The effective pressure associated with this boundary work is

$p_{mix} = -\rho_{mix} c^2$.

As space grows, the rate of mechanical work per unit volume is

$w = p_{mix} \cdot (dV/dt)/V = -3 H \rho_{mix} c^2$.

This is the direct SET expression for the expansion power density, the negative work performed by the boundary engine as it continuously generates space.

In this view, the cosmological constant is not a fixed vacuum term but the averaged output of countless causal boundaries operating at or below capacity.

Surface gravity provides the tension, Q the throughput, and their product sustains the expansion work.

The same energy ledger that closes perfectly for black holes now scales up to the universe as a whole.

SET therefore unifies gravitational tension, cosmic acceleration, and thermodynamic flux within a single mechanical identity:

Energy = Tension × Throughput.

Entropy Flow and the Second Law

If energy in SET is the product of surface tension and causal throughput, then the second law fixes the direction that process runs. Space emission—whether at a black-hole horizon or the Hubble horizon, follows the gradient that increases the number of accessible microstates. It is not a new force, it is the statistical arrow that picks the outward direction for the flux.

The flux runs from a hotter boundary to a colder exterior, exporting energy and information. At a causal boundary, the Tolman relation sets redshifted equilibrium:

$T_{red} \equiv T \times \alpha = \text{const},$

with α the gravitational redshift (lapse). As $\alpha \to 0$ near a horizon, the locally measured temperature for ideal static observers formally diverges, making the boundary the hot end of the gradient, the large scale universe, with near zero background temperature, is the cold end. The irreversible direction is therefore outward, from dense causal surfaces into the expanding vacuum.

Away from equilibrium, the local entropy production follows the standard identity of relativistic irreversible thermodynamics (Tolman–Ehrenfest included):

$\sigma \propto J_q \cdot \nabla(1 / (T \alpha)) \geq 0,$

where σ is entropy produced per unit volume per unit time, J_q is the local heat/information flux measured by static observers, and $\nabla(1/(T \alpha))$ is the spatial gradient of the inverse redshifted temperature.

In SET, the mechanical flux is Q (volumetric throughput/emanated space), the corresponding energy/heat flux density on capacity surfaces is $J_q \approx \varepsilon_V c$ (since $Q = A c$), with $\varepsilon_V = \hbar c^3 / (960 Q^2)$ the mixing cost energy density. So, as mass emanates space, entropy is maximized along the direction of decreasing redshifted temperature the same direction the flux already prefers.

By prefers, I mean a conserved volumetric flux emanated by a spherical mass defines a vector field whose final component on the boundary is outward. The interior flow lines end up tilting outward and, at the separatrix, join the outward normal, so the conserved flux that cannot accumulate inward must cross the boundary and add to exterior volume. In that sense, the second law's arrow and the conserved Q describe the same engine, one in thermodynamics (entropy increase), the other in mechanics(throughput).

The Second Law as the Driver of Expansion

The macroscopic work term derived earlier,

$w = p_{mix} \cdot (dV/dt)/V = -3H \rho_{mix} c^2,$

is therefore not arbitrary but the direct manifestation of this entropic gradient.

Expansion is the universe's way of obeying the second law at the largest possible scale.

Every increment of new space corresponds to a unit of entropy increase:

$dS = (dE + p\, dV) / T.$

With $p = -\rho c^2$, the term $p\, dV$ becomes the source of continuous entropy growth as the universe expands.

The same mechanism that powers Hawking emission in black holes, conversion of tension into space and information, sustains cosmic acceleration.

In SET, the second law and cosmic expansion are not separate, they are the same phenomenon seen at different scales.

The universe expands. Not by geometric decree, but because every boundary at capacity pushes information outward satisfying the thermodynamic arrow of time.

SET reframes the 2nd law as the law of space generation, Q.

Entropy increases because the causal fabric continuously mixes and exports information through its boundaries.

Each mass contributes to this global process, its local emission merging into the universal expansion flow.

In SET expansion raises entropy, and in SET's microphysics, entropy gradients make expansion the preferred outcome. More clearly, expansion is the channel by which the system obeys the second law. A hot causal boundary exporting mixing work into new volume raises total entropy faster than any alternative, so $H > 0$

The Second Law and the Direction of Expansion

In SET, energy conservation and entropy growth are not independent phenomena, they are two sides of the same causal process.

Every causal boundary operates as a thermodynamic engine that converts gravitational tension into space and information.

The same principle that governs black hole evaporation, conversion of κ into outward volumetric throughput Q extends to cosmic expansion.

The power density of this process, already derived as

$$w = p_{mix} \cdot (dV/dt)/V = -3H \rho_{mix} c^2,$$

represents the rate at which negative work is performed by the boundary on the expanding universe.

This work term is inherently positive in magnitude, since both H and ρ_{mix} are positive, ensuring that energy continuously flows outward from the hot causal surfaces into the colder cosmic domain.

Clausius Consistency and Entropy Production

From the Clausius relation, the total entropy rate for any steady energy flow is

$\dot{S}_{total} = P_{mix} (1/T_{bath} - 1/T_{src})$,

where P_{mix} is the total power transferred from the hot source(boundary) at temperature T_{src} to the cold bath(the universe) at T_{bath}.

In SET, $P_{mix} = -w\, V = 3H \rho_{mix} c^2 V \geq 0$, ensuring that energy always flows from higher to lower redshifted temperature.

The Tolman equilibrium condition,

$T \alpha = const$,

guarantees $T_{src} > T_{bath}$ because $\alpha \to 0$ near horizons.

So, the temperature contrast is

$(1/T_{bath} - 1/T_{src}) > 0$,

Which leads to the second law condition

$\dot{S}_{total} \geq 0$.

In density form, this becomes

$\dot{s}_{total} = 3H \rho_{mix} c^2 (1/T_{bath} - 1/T_{src}) \geq 0$.

Entropy production is therefore positive and directly proportional to the rate of cosmic expansion.

This relation shows that expansion is not an ad hoc geometric effect but the natural thermodynamic consequence of the causal engine running at capacity.

The universe expands because it must, it is the only way to satisfy $\dot{S} \geq 0$ on a cosmic scale.

The hot causal boundaries (high κ, high Q) export both energy and information into the cold background, performing PdV work that manifests as the observed acceleration of space.

In this picture, the cosmological arrow of time and the thermodynamic arrow of time are the same phenomenon. Space generation is simply entropy growth written in geometric language.

SET reframes the second law as a universal mechanical principle:

Every increase in entropy corresponds to the creation of new space.

Micro cause:

Mass sources a conserved volumetric flux Q. On any causal surface, mixing costs power

$P_{mix} = \varepsilon_V \cdot Q$ with $\varepsilon_V = \hbar c^3/(960 Q^2)$ (per SET).

Cosmologically, summing over sources gives a net PdV channel.

Expansion kinematics:

Total flux is the volume growth: $Q_{total} = dV/dt$.

Hence $H = (1/3)(\dot{V}/V) = Q_{total}/(3V)$. Expansion rate is set by total emanation.

Power and entropy production (Clausius/Tolman):

Power density exported to the bath: $w = -3H \rho_{mix} c^2$.

Entropy production density:

$\dot{s} = w \cdot (1/T_{bath} - 1/T_{src}) \geq 0$, with $T_{src}\, \alpha_{src} = \text{const}$ and $\alpha_{src} \to 0 \Rightarrow T_{src} \gg T_{bath}$.

Therefore $\dot{s} \propto H \propto Q_{total}$.

Causality vs necessity:

Causal direction, $Q \to PdV \to \dot{S}$. Turn off Q (no emanation) $\to H=0 \to \dot{s}=0$.

Second law necessity, given hot boundaries and a cold bath, the only available channel (in SET) to raise entropy is outward mixing work, expansion cannot be negative on net without violating $\dot{s} \geq 0$.

Microphysics: Expansion causes entropy increase (because Q sets H and $\dot{s} \propto H$).

Macrophysics/constraint: Entropy must increase selects and sustains expansion as the available route.

In SET, expansion and entropy growth are the same engine, Q fixes H (kinematics), and Clausius fixes $\dot{s}$ (thermodynamics). The flux causes the growth, the second law fixes its sign.

Contemplating Aeff section

Boundary “frame rate” and black holes

Think of the boundary Σ as a nozzle with pure geometric capacity $Q_{set} = A_{eff} \cdot c$, and utilization $\phi \equiv Q/Q_{set} \in [0,1)$. As ϕ rises the boundary clock stretches:
$Time_{\Sigma} = 1/\alpha_{\Sigma} = 1/\sqrt{(1 - \phi^2)}$. Near a horizon $\phi \to 1$, the nozzle is saturated and the boundary clock crawls.

A good mental model is a movie frame rate. The mass inside keeps playing/has time (emitting flux), but the saturated nozzle lets out only a few pixels per second, so the picture/screen/event horizon looks almost black from outside. Nothing freezes; the channel is just throttled by capacity/the movie is playing really slow.

There’s a single dial that quantifies how hard you’ve squeezed the same mass M through a smaller nozzle. Compare the flux at a loose spherical boundary R to the black hole boundary R_s:
$Q(R) = 4\pi R^2\sqrt{(2GM/R)}$
$Q_{BH}(M) = 4\pi R_s^2\, c$
Slow down factor (throughput time): $N \equiv Q(R)/Q_{BH} = (R/R_s)^{(3/2)}$.

N says: how many BH boundary seconds must elapse to emit the same volume that one second at R emits.

Earth-mass example (reference = Earth’s surface):
$R/R_s \approx 7.18\times10^8 \rightarrow N \approx 1.9\times10^{13}$. One Earth-surface second of emitted volume = ~1.9×10^{13} BH-boundary seconds for the same mass.
Sun-mass example (reference = photosphere):
$R/R_s \approx 2.36\times10^5 \rightarrow N \approx 1.14\times10^8$.

Different N because compactness R/R_s is different: the Sun is far closer to its own Schwarzschild scale than Earth. As an object contracts ($R \downarrow$), N falls monotonically; at $R=R_s$, $N=1$ (the nozzle is at capacity).

We must not conflate this two dials,
$\alpha(r) = \sqrt{(1 - R_s/r)}$: the kinematic clock stretch (time dilation) that governs dynamics and hover accelerations.
$N = (R/R_s)^{(3/2)}$: the capacity compression of the same source when you move the boundary from R to R_s (how the “frame rate” drops).

Both grow harsher with compactness, but they speak to different aspects: α is the local clock; N is the throughput time needed to deliver the same flux through the tighter nozzle. In SET, time, information, and expansion meet at the boundary, geometry fixes capacity, capacity sets ϕ, and ϕ sets how slow the boundary clock appears while the interior keeps talking. N also tells us that time is not zero inside the BH.

Source vs. nozzle (two independent budgets)

I dont want to confuse you here. So let me be clear Qset, which I am considering to call Qs in honor of Schwarzschild. What Schwarzschild did was take the escape velocity formula $V_{esc}= \sqrt{2GM/R}$ and set it to c, very clever, such that $c = \sqrt{2GM/R}$, which leads to $c^2= 2GM/R$ such that $R_s= 2GM/c^2$. This solution is use everywhere in current physics. For SET I realize I could turn the flux on any surface to c, Such that I could take earth which has S= 11186 m/s at its 6371000 meters radius and without calculating an Rs just set the flux to c at the R_0 so that for any mass/planet/star I am examining I can set a clock/lapse diagnostic on any surface I choose through $Q_s= 4\pi R_0 c$ (not to be confuse with $Q=4\pi R_s^2 c \rightarrow$emanated volume per second BH)
when I ratio
$Q=4\pi\sqrt{GMR^3}$ / $Q_s= 4\pi R_0 c$
I can solve time dilation through this diagnostic. Why do I use Q over Rs/R. The only reason I use total flux rather than the classical ratio $\sqrt{R_s/R}$ was not to overcomplicate things but rather to explore if I could get a time dilation picture out of a flux picture. Meaning if gravity is this flux can we get the same observational, already tested results.

Production (source law):
$Q = \iiint \sqrt{(24\cdot\pi\cdot G\cdot\rho)}\, d^3x$.
This is set by how the mass is arranged (ρ), not by the boundary.

Capacity of the boundary:
$Q_s(\Sigma) = A_{eff}(\Sigma)\cdot c$, and $\phi \equiv Q/Q_s$.
This is a hard upper bound: $Q \leq Q_s$. It does not make Q; it only caps it.

So if you shrink A_{eff} while keeping the interior mass distribution the same, Q does not change (production unchanged). What changes is the readout and the clock on Σ: ϕ ↑, $\alpha_\Sigma = \sqrt{(1-\phi^2)}$ ↓, $V_{esc} = Q/A_{eff}$ ↑. But Q/M is untouched by A_{eff} alone.

Q/M falls when you add mass at fixed boundary, that's a source effect, not a nozzle effect. The SET source law is concave in ρ, If you double mass by doubling density in the same volume,
ρ → 2ρ, then
$Q \propto \sqrt{\rho}\, V \to \sqrt{(2\rho)}\, V = \sqrt{2} \cdot (\sqrt{\rho}\, V)$.
Mass doubled (×2), Q only grows by $\sqrt{2}$, so Q/M drops by $1/\sqrt{2}$.

Just for illustrating with numbers (V=1):
One lump: ρ=1 → M=1, Q=1 → Q/M=1.
Same region, stacked: ρ=2 → M=2, $Q=\sqrt{2} \Rightarrow Q/M=\sqrt{2}/2 \approx 0.707$.

Two disjoint lumps (parallel channels): total M=2, total Q=2 → Q/M=1.
Stacking merges channels (sub-additive $\sqrt{\rho}$), separation runs them in parallel (additive).

The nozzle still has capacity which is an upper bound, not a pump. Unless $\phi \approx 1$ (near-horizon), the boundary is not limiting; the source is. Increasing M in the same region raises Q sublinearly ($\propto \sqrt{\rho}$), so Q/M falls even with spare capacity. Only when Q tries to exceed A_eff·c does the boundary saturate ($\phi \to 1$).

Time dilation, at fixed A_eff, adding mass (higher ρ) makes Q rise sublinearly, so $\phi = Q/(A_{eff} \cdot c)$ rises, so $\text{Time}_\Sigma = 1/\alpha_\Sigma = 1/\sqrt{(1-\phi^2)}$ increases (slower clock). The less per kg you see in coordinate time is exactly what the slower boundary clock encodes. In proper time on Σ you count $dV/d\tau = Q/\alpha_\Sigma$, in proper time you partly offset the less per kg by a factor $1/\Sigma$

Is A_eff observable

Axiom 1 , Local Divergence Law

$\nabla \cdot S = \sqrt{(24\pi G \rho)}$.

Using $\rho = (24\pi G M^2)/Q^2$ gives

$\nabla \cdot S = \sqrt{(24\, \pi\, G \cdot 24\, \pi\, G\, M^2 / Q^2)}$

Simplify:

$\nabla \cdot S = (24\pi G M)/Q$

We make the local source term explicit and tie it to dilution and geometry for boundary value use.

$(\nabla \cdot S)^2 = 24\pi G\, \rho = (24\pi G)^2\, M^2/Q^2$.

The integrand is $\sqrt{\rho}$, what I mean is that every small region of mass contributes to the total space flux according to the square root of its density, not directly to its density.
That changes everything. In classical physics, Newton or GR, if you double the mass, you double the pull. The effect adds up linearly.

In SET, that does not happen. Doubling the mass only multiplies the local contribution by $\sqrt{2}$. That means space creation dilutes/decreases as systems get larger or denser, big masses do not just add up their influence, they share a common flux budget that spreads out through geometry/boundary/Aeff and Q.

So the total flux that comes out of a body is limited by how much space it can push out at its boundary/separatrix, such that how that flux spreads depends on the object's shape, how the mass is arranged/spread, and on its flux capacity Q. Two objects with the same mass can produce very different emanation patterns if their geometry or spin differs.

That's why SET breaks the linear superposition you see in GR and Newton. It's not something added by hand nor postulated, Once we accept mass driven expansion at the rate of $q=\sqrt{2GMR^3}$, $\sqrt{\rho}$ follows instead of ρ.

A_eff is geometry you can measure. It's an observable, and it carries hard, falsifiable consequences.

Geometry follows baryons (no tuning).
If the mass is spherical, use $A_{eff} = 4\cdot\pi\cdot R^2$; if it's a thin, two-sided disk, $A_{eff} \approx 2\cdot\pi\cdot R^2$; for oblate/prolate shells, A_eff is fixed by the measured axis ratio via the closed-form surface-area formulas. In practice you pick Σ to be an isodensity (or isophote/gas) shell at the radius you probe. Once Σ is chosen from data, A_eff is determined, no free knobs. Then the readout is mechanical:
$V_{esc}(\Sigma) = Q / A_{eff}(\Sigma)$, $V_{orb}(\Sigma) \approx V_{esc}/\sqrt{2}$.
This builds the "disk boost" directly from the observed shape, not from adding invisible mass.

Black holes show A_eff as a physical surface. This is the great things about extreme examples/cases, they gives us clarity about non transparent issues. I could take a simple example that seems entirely subjective, and neutral. And make it objective and define into dichotomy of good and bad just by taking it to

the extreme. For example I could debate you ad infinitum about whether having kids or not, which is the best, superior choice? And hardly clear answer would ever be reach. But If I take it to the extreme. For example If I were to say. If everyone on earth chooses to not have kids or everyone on earth chooses to have kids which would have the worst outcome for the future of humanity. The answer comes out cleanly.
At horizons you have a literal boundary with area $A_{eff} = 4\cdot\pi\cdot R_s^2$ and a causal capacity $Q_{set} = A_{eff}\cdot c$. In SET, $\phi \equiv Q/Q_{set} \to 1$ at the horizon. This isn't a metaphor: horizon area is an observable scale (shadow size, ringdown frequency), and the capacity $Q_{set} = A_{eff}\cdot c$ is the exact causal cap that any flux must respect ($|S| \le c$). So A_{eff} is a real, dynamical surface that controls clocks ($\alpha_\Sigma = \sqrt{(1-\phi^2)}$) and kinematics at the boundary.

A_{eff} enforces testable limits. Given $A_{eff}(\Sigma)$ from imaging and Q from baryons ($Q = \iiint \sqrt{(24\cdot\pi\cdot G\cdot\rho)}\, d^3x$), SET fixes the utilization $\phi = Q/(A_{eff}\cdot c)$ and predicts both speeds and clock stretch:
$\text{Time}_\Sigma = 1/\alpha_\Sigma = 1/\sqrt{(1-\phi^2)}$, $V_{esc}(\Sigma) = Q/A_{eff}(\Sigma)$.
Change the geometry while keeping baryonic mass similar (a puffier UDG vs a compact dwarf, or an oblate vs prolate cluster), and SET says the ratio of speeds tracks the measured ratio of A_{eff}'s. If observations were to violate these geometry locked predictions, SET fails. But it doesn't, A_{eff} is constrained up front by the map of baryons, it is not something you dial in after the fact. And so far every instance that is been dialed in the results come out flawlessly.

Observational handle on A_{eff} from Black Hole images

Event horizon scale imaging (EHT of M87* and Sgr A*) resolves a bright photon ring around a dark shadow. The shadow size is set by the critical impact parameter $b_{crit} = \sqrt{27}\cdot GM/c^2$, so the shadow diameter is $D_{shadow} \approx 2\, b_{crit} \approx 5.196\cdot R_s$ with $R_s = 2GM/c^2$. In SET, A_{eff} is the physical boundary area that sets the capacity $Q_s = A_{eff}\cdot c$, so the ring gives us a direct observable handle on that boundary.

From image to boundary (capacity).
Measure the angular ring diameter θ_{ring}, with angular diameter distance D_A, get the physical diameter $D_{shadow} = \theta_{ring}\cdot D_A$. Then
$R_s = D_{shadow} / 5.196$,
$A_{eff}(\text{horizon}) = 4\pi R_s^2$,
$Q_{set} = A_{eff}\cdot c = 4\pi R_s^2 c$.
Observationally we infer Rs from the shadow geometry just outside the horizon.

Direct Q from the ring (BH case).
For a BH, $Q = 4\pi R_s^2 c$ and $b_{crit} = (3\sqrt{3}/4\sqrt{\pi})\sqrt{(Q/c)}$, hence
$D_{shadow} = 2\, b_{crit} = (3\sqrt{3}/2\sqrt{\pi})\sqrt{(Q/c)}$.
Invert to get flux purely from the image:
$Q = (4\pi c / 27) \cdot D_{shadow}^2$
$= (4\pi c / 27) \cdot (\theta_{ring} D_A)^2$.
This is an image based proxy for the horizon's volumetric throughput in SET.

One surface variables.
Using $GM = Q^2/(32\pi^2 R_0^3)$,
$b_{crit} = (3\sqrt{3}/c^2)\, GM = (3\sqrt{3} / 32\pi^2 c^2) \cdot Q^2/R_0^3$.
For an actual BH, set $R_0 = R_s$ and you recover the square-root form above.

This is important for A_eff as an observable.
The photon ring size pins down Rs and thus $Aeff = 4\pi R_s^2$ a physically demarcated boundary. With A_eff known and Q fixed (either by the BH identity $Q = 4\pi R_s^2 c$ or independently from dynamics), the utilization $\phi = Q/(A_{eff} c)$ and the boundary clock $Time_\Sigma = 1/\sqrt{(1 - \phi^2)}$ are determined without halos/DM or tuned constants.
The geometric shadow and the bright emission ring are not identical; use the geometric diameter for D_shadow. Interstellar scattering (notably for Sgr A*) and model choices can bias θ_ring; the mapping above applies to the geometry-dominated ring core.

Takeaway: EHT ring → D_shadow → R_s → A_eff → Q_set.
For black holes you can even go straight to flux:
$Q = (4\pi c / 27) \cdot D_{shadow}^2$.

Image only BH flux from the shadow geometry

For M87* and Sgr A*, the geometric shadow diameter fix the flux without using M or G:
$Q_{img} = (4 \cdot pi \cdot c/27) * D_{shadow}^2 = (4 \cdot pi \cdot c/27) * (theta_{ring} * D_A)^2$.

Independently, dynamics (stellar orbits/ringdown) fix GM, giving a flux prediction:
$Q_{dyn} = 4 \cdot pi \cdot Rs^2 \cdot c = 4 \cdot pi \cdot (2GM/c^2)^2 \cdot c = (16 \cdot pi \cdot G^2 \cdot M^2)/c^3$.

If A_eff is a true causal boundary, Q_img and Q_dyn must agree within calibrated systematics (scattering for Sgr A*, calibration/modeling for both).

The observed consistency at a 10% level is exactly what SET expects when the horizon acts as a saturated nozzle, $Q = Q_{set} = A_{eff} \cdot c$. A significant mismatch

would undercut A_eff, the present agreement is a single strong reason to assign high weight to A_eff as a physical thing we can observe.

M87*
Inputs (image only): $\theta_{ring} = 42\ \mu as$, $D_A = 16.8$ Mpc → $D_{shadow} = 1.056\times10^{14}$ m.
$Q_{img} = (4\pi c/27)\cdot D_{shadow}^2 = 1.555\times10^{36}$ m³/s.
Independent dynamics: $M = 6.5\times10^9\ M_\odot$ → $Q_{dyn} = 16\pi G^2M^2/c^3 = 1.388\times10^{36}$ m³/s.
Match: +12% (image a bit higher).
Cross check: R_s from image = 2.031×10^{13} m vs R_s from M = 1.920×10^{13} m → +5.8%.

Sgr A*
Inputs (image only): $\theta_{ring} = 51.8\ \mu as$, $D_A = 8.178$ kpc → $D_{shadow} = 6.337\times10^{10}$ m.
$Q_{img} = (4\pi c/27)\cdot D_{shadow}^2 = 5.604\times10^{29}$ m³/s.
Independent dynamics: $M = 4.30\times10^6\ M_\odot$ → $Q_{dyn} = 16\pi G^2M^2/c^3 = 6.076\times10^{29}$ m³/s.
Match: −7.8% (image a bit lower).
Cross check: R_s from image = 1.220×10^{10} m vs R_s from M = 1.270×10^{10} m → −4.0%.

Why A_eff must be physical (no runaway collapse)

Suppose the boundary could shrink while M stayed the same. Then A_eff ↓ but Q is fixed by M ($Q = 4\pi R_s^2\ c$), so $\phi = Q/(A_{eff}\ c)$ would exceed 1. That would require $|S|>c$ somewhere on Σ and drive $\alpha_\Sigma = \sqrt{(1-\phi^2)}$ imaginary, violating the invariant. Therefore:

At fixed mass, the horizon area cannot decrease. A_eff at the event horizon is the minimum boundary per that mass.
The only way A_eff can get smaller is if M decreases (Hawking evaporation), which lowers R_s and Q together and keeps $\phi = 1$.

This matches GR's classical area law (no horizon area decrease without energy outflow) and the empirical fact that BH scale setting observables (shadow/ring size, ringdown frequencies, stellar orbits) track $R_s \simeq 2GM/c^2$ not some ever shrinking boundary.

A BH in SET is a nozzle/virtual enclosing surface the mass is contain within already at full capacity/meaning all new flux of space coming out from the system/BH cannot do so faster than c. Shrinking the opening at the same mass would demand superluminal throughput to carry the same flux, ruled out by the speed limit. A BH offers us the perfect case at which we can measure a clearly demarcated Aeff. Clearly defining an in and out area define by the event horizon which is akin a separatrix in SET. In the BH formation case, the gravitational collapse of mass brings out the inevitable event horizon, Aeff, that stops an infinite collapse/singularity. Rs cannot decrease further than $2GM/c^2$. A clear inside Aeff and outside Aeff is delimited

Horizon = minimal throughput, maximal speed boundary

For a fixed mass M, the SET flux on a spherical source surface R_0 is
$Q(R_0) = 4\pi R_0^2 \sqrt{(2GM/R_0)} = 4\pi \sqrt{(2GM)} \cdot R_0^{3/2}$.
This grows monotonically with $R_0^{3/2}$, so shrinking the source surface reduces Q. The smallest physical surface is the horizon, $R_s = 2GM/c^2$, where the local space speed saturates to c. Hence a black hole is the minimum throughput configuration for a given mass,

Minimum flux, $Q_{min} = 4\pi R_s^2 c$.
Capacity saturated: at the horizon $\phi \equiv Q/Q_{set} = 1$ with $Q_{set} = A_{eff} c$ and $A_{eff} = 4\pi R_s^2$.
Boundary clock: $\alpha_\Sigma \to 0$ (the boundary is an opaque nozzle/even horizon: capacity reached; no spare clock rate at Σ.

SET understands light cannot escape the BH making it look black, not because nothing happens inside, In SET the same mass flux is forced through the smallest nozzle/effective area, so Q is at its minimal for that amount of mass an information interpretation of the flux through SET, could interpret the outgoing complexity rate per coordinate second is minimal even though the local flux speed at the boundary is maximal ($|S| = c$).

$N \equiv Q(R_{ref}) / Q_{BH}(M)$
$= [4\pi \sqrt{(2GM)} R_{ref}^{3/2}] / [4\pi \sqrt{(2GM)} R_s^{3/2}]$
$= (R_{ref} / R_s)^{3/2}$.

N is how many BH boundary seconds of flux you need to match one second of flux from the same mass at radius R_ref." (Always $N \geq 1$ for $R_{ref} \geq R_s$.)

Earth mass case

R_ref / R_s ≈ 6.37×10^{6} m / 8.87×10^{-3} m ≈ 7.2×10^{8} → N ≈ (7.2×10^{8})^{3/2} ≈ 1.9×10^{13}.
You see roughly one BH pixel of flux for every ~1.9×10^{13} pixels from the same mass spread to Earth's size.
Sun mass case
R_ref / R_s ≈ 6.96×10^{8} m / 2.95×10^{3} m ≈ 2.36×10^{5} → N ≈ 1.1×10^{8}.

Here we take the same mass M and comparing its flux on a loose source/regular radius surface R_ref to the flux forced through a black hole horizon Rs. Using Q(R) = 4π √(2GM) · R^(3/2), the ratio is N = Q(R_ref)/Q_BH = (R_ref/R_s)^(3/2) ≥

Read N as how many seconds the BH boundary would take to emit the same total volume one second at R_ref emits.
For Earth, R_ref/R_s ≈ 7.2×10^{8} → N ≈ 1.9×10^{13}; for the Sun, R_ref/R_s ≈ 2.36×10^{5} → N ≈ 1.1×10^{8}.

In SET, where entropy flow tracks flux, the BH is the minimum throughput nozzle for that mass/minimal flux for that mass, the entropy rate per external second is throttled (while the total entropy remains huge/BH holds huge entropy inside). At the saturated boundary ϕ = Q/Q_set → 1 the boundary clock crawls (α_Σ → 0), which matches, the less time, lower entropy rate/the system drips out very little entropy/flux, intuition without touching the large stock of BH entropy.

The movie still plays, but with the horizon acting as a tiny, saturated aperture the frame rate (as counted in coordinate time) is so low the screen looks black. Inside, microphysics can remain active, it's the boundary utilization ϕ → 1 that makes the outgoing stream extraordinarily sparse in the far observer's time. If we regard the flux as the information coming out from said mass. We would see that any mass is at its minimal sharing when compacted into a BH.

I've always had an issue with the usual interpretations of black holes, singularities, wormholes, infinite density, extra dimensions. In SET there is no singularity. A BH forms because the outward flux speed reaches c on a closed surface, that surface is the physical boundary (the separatrix/event horizon). It separates "in" from "out."

Inside, SET takes the mass to decompress into a homogeneous density medium. So instead of crushing, anything that falls in, must transform toward the same uniform interior density. Practically, a ship crossing the horizon would not be smashed at the surface, it would be processed toward the interior mean density as it joins the bulk.

Mean interior density (from M inside volume 4/3 π R_s^3):
$\bar{\rho} = 3M / (4\pi R_s^3) = 3 c^6 / (32 \pi G^3 M^2)$.

This falls sharply with mass, so supermassive BHs have very low average interior density (much lower than rock; for the biggest, even below air). That's consistent with the SET decompression interpretation, the larger the BH, the gentler the mean density it enforces.

In SET, BH's experience passage of time inside the horizon. The boundary clock (the lapse on the separatrix) tends to zero precisely where $|S| \to c$, that's what defines the horizon. But once inside, proper time still runs, although slowly, only the boundary itself has $\alpha \to 0$. In SET everything that has a flux has time. And everything/every mass/everything has a flux it is just at its minimum for BH's.

Defining A_eff and where it sits

$\nabla \cdot S = \partial S_x/\partial x + \partial S_y/\partial y + \partial S_z/\partial z$

Define A_eff as the area of the separatrix Σ*, the outermost outward only shell. In symbols, $A_{eff} = \iint_{\Sigma^*} dA$. On Σ*, Qout = Q and Qin = 0, so the kinematic readout $V_{esc} = Q / A_{eff}$ and the boundary clock $\alpha_{\Sigma^*} = \sqrt{(1 - (Q / (A_{eff}\, c))^2)}$ are fixed by data, fully tied to the observed baryon geometry and the reconstructed S. (Here $\hat{n}$ is the outward normal; S is the flux vector.)

Black holes. Σ* is the horizon: $A_{eff} = 4\pi R_s^2$, $Q = A_{eff}\, c$, $\phi = 1$, $\alpha_{\Sigma^*} \to 0$. The nozzle is saturated.

The separatrix Σ* is the first closed, no mixing shell around the subsystem where every streamline/flux vector lines that reaches the surface points outward. Think of it as the meeting line, interior outflow and any exterior inflow come together at Σ* and from there continue as a single, outward flux. On Σ* there is no inflow anywhere, so the flux through it is purely the subsystem's own production, Qout = Qnet = Q. Larger enclosing surfaces also have the same net flux Q (by conservation), but they can include inward patches that re-exit elsewhere and they add unnecessary area, diluting Q/A. Placing A_eff at Σ* guarantees you are not inside the system (where not all streamlines/flux vectors have emerged yet) and not so far out that you oversize the nozzle area. So we define A_eff as the surface area of Σ* ($A_{eff} = \iint$ over Σ* dA): the wetted throat where outflow is clean and total. In short, the separatrix Σ* is the outermost closed surface where the normal flux is never inward $S \cdot \hat{n} \geq 0$ everywhere, encountered as you move

outward from the center/interior (r = 0) to the first radius at which no inward patches/vectors remain.

Two body flux Hill estimate (1D neutral point)

For two nearly spherical, disjoint sources with fluxes Q1 and Q2 separated by a distance L, the neutral point along the line of centers (where the outward magnitudes balance) is
$x1 = L / (1 + \sqrt{(Q2/Q1)}) = L \cdot \sqrt{Q1} / (\sqrt{Q1} + \sqrt{Q2})$,
$x2 = L - x1 = L \cdot \sqrt{Q2} / (\sqrt{Q1} + \sqrt{Q2})$.

Derivation, outside each source the field is radial with $|S| = Q / (4\pi r^2)$; neutrality requires $Q1 / x1^2 = Q2 / (L - x1)^2$.

In three dimensions, the separatrix Σ^* passes through this point and closes into a Roche/Hill like lobe. I use the 1D location as a fast initial guess, then refine the full surface with the stream shell method (solve $\nabla^2\psi = \sqrt{(24\pi G \rho)}$ with $\psi \to 0$ at infinity, set $S = \nabla\psi$, and pick the outermost closed level set with $S \cdot \hat{n} \geq 0$ everywhere).

To illustrate the flux Hill estimate, consider two nearly spherical, disjoint sources with fluxes Q1 and Q2 separated by distance L. For equal fluxes (Q1 = Q2), the neutral point lies at x = L/2, as expected by symmetry. For a dominant source ($Q1 \gg Q2$), $x \approx L$, placing the neutral point close to the weaker body, the separatrix lobe around it, is engulfed by the stronger source's field.

Numerical illustration. Take Q1 = 1 (arbitrary units), Q2 = 0.25, L = 10. Then $x = 10 / (1 + \sqrt{(0.25/1)}) = 10 / 1.5 = 6.67$.

Measured from body 1 toward body 2, the neutral point sits nearer body 2. In 3D, this 1D point anchors the full separatrix lobe, which you then refine with the stream shell method.

For disjoint sources the conserved flux adds: Qtotal = Q1 + Q2. Sub-additivity arises only when densities overlap within the same volume element (the $\sqrt{\rho}$ source law), not in this separated two body case.

BELOW THERE ARE JUST NOTES, I TAKE WHILE THINKING: (Pondering)

You can never step out of your own flux: doing so would require a speed faster than c relative to your own F^μ. You can outpace your historic shells (previously emitted flux farther out), but you cannot outrun your instantaneous surface flux; you are always embedded in your own space.

The gravitational lapse (clock factor) is just the remaining share of the c-budget,
$\alpha(r) \equiv V_{time}/c = \sqrt{(1 - V_{space}(r)^2/c^2)}$,
so local clock rate obeys $d\tau/dt = \alpha$. In this sense all time dilation in SET is kinematic, whether you move through space (ordinary kinematic dilation) or space moves through you (gravitational environment with nonzero V_space), it is the same partition of c into "space speed" and "time speed." What produces gravity is not α itself but its spatial gradient:

$g = c^2 \nabla \ln\alpha$ (radially, $g = GM / [r^2 \alpha] \rightarrow GM/r^2$ in the weak field).

If α were uniform, clocks would all slow by the same factor yet there would be no inward pull.
In SET language, as Vspace rises and α falls, the escape requirement measured locally scales like $(1/\alpha - 1)\, c^2$, which ramps up far faster than the Newtonian $\frac{1}{2} v^2$ intuition. The local energy per kg to escape from rest, is what blows up near compact objects. You don't feel slow time, but you do pay the fuel bill. Put differently, the lapse gradient is the force driver ($g = c^2 \nabla \ln \alpha$), and the dwindling lapse (small α) makes the energy price to reach the escape $\gamma = 1/\alpha$ explode/increase steeply.
observers inside dilation are unaware locally, but comparative signals, weight, and required energy reveal the smaller Vtime budget. This reconciles the intuition with SET's dynamics.

In SET the conserved flux Q fixes an outward space speed field $V_{space}(r) = \sqrt{(2GM/r)}$ once calibrated on a single source surface. The invariant $c^2 = V_{space}^2 + V_{time}^2$ then yields the lapse $\alpha(r) = \sqrt{(1 - V_{space}^2/c^2)}$. A distant (cosmic-time) observer sees the tangential coordinate speed of light reduced to $v_{tan} = c\,\alpha$, the photon covers fewer horizontal meters per cosmic second; this is the precise content behind my intuition that outward emanation "eats meters". Locally, a proper observer still times the photon at c because their seconds are longer by 1/α. Redshift and Shapiro delay therefore path stretching effects encoded entirely by α, while deflection follows from the spatial gradient of α ($g = c^2 \nabla \ln \alpha$).

Two geometries for "meters eaten"

Tangential ray, radial flow (near-spherical field).

The flow S is outward and the light ray skims around the mass, so the along-ray component $S_{\parallel} \approx 0$. The distant (coordinate) observer sees a tangential light speed $c_{tan} = c \cdot \alpha$, with $\alpha = \sqrt{(1 - 2GM/(c^2 r))}$. The shortfall rate is

$\Delta\dot{\ell} = c - c \cdot \alpha \approx V_{space}^2/(2c)$ in the weak field, so it grows quadratically with V_{space}.

Tiny check at Earth's surface: $V_{space} \approx 11.2$ km/s $\Rightarrow \Delta\dot{\ell} \approx (11\,200 \text{ m/s})^2/(2c) \approx 0.21$ m/s (the familiar, tiny Shapiro-type slowdown).

Ray aligned with the flow ($S_{\parallel} \neq 0$).

If the outward flow has a component along the ray (e.g., cosmological recession or a line of sight with nonzero $S_{\parallel}$), the separation grows as

$\Delta\ell \approx \int S_{\parallel}\, dt$, so $\Delta\dot{\ell} = S_{\parallel}$, i.e., linear in that component.

When the flow is across the path, the coordinate speed change comes from the c budget, $c^2 = V_{space}^2 + V_{time}^2$, so $\sqrt{(c^2 - V_{space}^2)} \approx c - V_{space}^2/(2c)$. When the flow is along the path, it simply advects the source detector gap at rate $S_{\parallel}$.

Strong-field note.

As $r \to R_s$, $\alpha \to 0$ and $c_{tan} = c \cdot \alpha \to 0$, so $\Delta\dot{\ell} = c(1 - \alpha)$ grows steeply and nonlinearly —but that nonlinearity is controlled by $\alpha(r)$, not a linear S term, in the tangential case.

All observed time-rate effects are speed time effects: either from an observer's motion through space or from space (the emanated flux) traversing the observer. In SET we prefer the term time extension: the local proper-time rate slows, so one proper second spans more coordinate time. We assume the space-flux propagates at c; because interactions between mass and space are limited by c, the passage of this flux reduces the local update rate of physical processes, delaying events relative to a distant observer. Thus gravitational time effects are reinterpreted kinematically as the consequence of relative speed between matter and the space flux.5. Emanated space traverses the observer at escape velocity at every point.

Emanated space flux causes kinematic time dilation gradient on the orbiting mass pulling objects inward.

There is no slope or curvature of spacetime. Apparent curvature arises from the dynamic emanation and redistribution of emanated space outward into the larger expanding universe and its interaction with mass, at the speed limit c. There is no different densities of space, but a change in perceive density/curvature/gradient due to distortions cause by the speed of emanation/speed space traverses the observer and the speed limit c at which mass/space interacts and space/space interacts.

Emanation occurs isotropically, scaling geometrically with r, and mass distribution .

The maximal speed of space outward from the source is c, which in turn limits the total volume emanated per mass per density. The limit marks the event horizon.

Cosmic time is the expansion of the universe.

Hypothetical:

Could this hint at a minimum mass for a black hole? Maybe, and maybe not.
The resulting geometry of having a c flux from different Rs, but different escape velocities at the same distance from an event horizon just because the Rs is larger/ smaller hints at a possibility of a minimum mass for which a black hole is no longer possible. At which the dispersion of the flux radially outward is of magnitude such that c cannot be accomplish at the Rs.

If we go back to the condition:

circumference_factor = Rs + ct / Rs

Rs= 1
circumference = (Rs + (c * t)) / Rs
Result = 299792459.0

Rs= 1.0000000033356409
circumference = (Rs + (c * t)) / Rs
result= 299792458.0

Rs= 100
circumference = (Rs + (c * t)) / Rs
Result = 2997925.58

Rs= 100000
circumference = (Rs + (c * t)) / Rs
Result= 2998.92458

Geometrically, for a smaller Rs the emitted space is diluted much more strongly relative to the mass. This could suggest that maintaining or creating a coherent event horizon as envisioned might become increasingly difficult as Rs decreases. There may even be a threshold below which the geometry does not support the formation of a stable event horizon purely from the flux dynamics.

Light bending in SET via the Blind Screamer (Fermat) picture (just pondering)

Blind Screamer intuition (why causality bends paths).
If signals have a finite speed, you never see the world instantaneously. Picture a blindfolded Screamer in a car on a road lined with evenly spaced spectators. The Screamer shouts, spectators clap when they hear it. At rest, the claps arrive uniformly from all directions, the

crowd feels evenly dense/evenly spread. At high speed, sound from behind takes longer to arrive than sound from ahead. The Screamer now perceives more clap density/claps in front and less behind, even though the spectators are still evenly spaced. Finite signal speed creates an effective density gradient/distortion/slope/unevenness whenever motion is involved.

In SET the signal speed is c, the medium is space itself, and the local flow/clock field make space unevenly tile with a pattern that can be drawn as a curve slope that follows the time dilation gradient, due to tile size/time dilation . Light, which moves at c relative to space, then follows the least time path through that inhomogeneous medium, bending toward the side that reaches c in the shortest time/shortest path.
Tile floor (sbit) intuition.
Imagine a tile floor (a quantized picture of space). You move at a fixed budget, tiles per second = c, and you always choose the shortest time route. If tiles get bigger toward the mass, stepping into each tile gets you further (higher “price per meter”), you naturally veer where the time cost is lower. Also, if the floor is swapping tiles as you walk which counts as an additional step, some of your swapping tiles per second are eaten/subtracted from your fix budget of tiles per second, In SET:

Flow/advection (swapping floor): the inward space flow S eats some transverse meters each second, half the bend.

Slow clocks (bigger tiles): alpha < 1 makes each meter cost more coordinate seconds, the other half.

Static Background in SET? (Pondering)

in SET, a galaxy riding its historic shell can adopt a comoving vantage where the background is effectively static and only the local emanation rate matters. That’s just a covariant way of choosing the rest frame of the flow F^μ. It’s a legitimate frame choice.
A comoving observer moving along with/attached to a historic shell (an integral slice of the emanation flow F^μ) perceives an effectively stationary background.

More clearly, each historic shell expands self similarly with the emanation field. To observers comoving with it, the universe around them appears locally time independent, only the local rate of emanation (the divergence of the flow) sets the scale of expansion. The sense of rest in SET is therefore defined not by static coordinates, but by motion with the causal fabric itself.

If space(emanated chunk/shell of space) is moving away(push away by newly emanated space) and you are moving away at the same speed you perceive an almost static background. With your only movement relative to your background space coming from your local emanation.